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COMMITTEE ON FORESTS

Forestry on Dominion Lands

BY

J. H. WHITE, M.A., B.Sc.F.

Faculty of Forestry, Toronto University

Reprinted from *Forest Protection in Canada, 1913-1914*,
Commission of Conservation

OTTAWA, 1915

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INTRODUCTION

THIS report, the result of a study made during the summer of 1913, has been prepared in order to emphasize the need for the adoption of the following fire protective measures:

1. Careful consideration of the question of slash disposal is necessary in connection with all cutting operations on Dominion timber lands, with the enforcement of such regulations as may be found suitable in each case. This refers not only to forest reserves, which are under the jurisdiction of the Forestry Branch, but also to all timber limits, including those inside forest reserves and parks, and operations on lands outside forest reserves and parks, all of which are under the jurisdiction of the Timber and Grazing Branch. There is no provision for this at the present time in connection with operations on licensed timber berths, which are under the jurisdiction of the Timber and Grazing Branch. It is, however, wholly possible to take such action without additional legislation, since the licenses all provide that "the licensee . . . shall dispose of the tops and branches and other ~~debris~~ of lumbering operations in such a way as to prevent as far as possible the danger of fire, in accordance with the directions of the ~~other~~ officers of the Department of the Interior." Further, the licenses are renewed annually, and are made subject to the terms and conditions fixed by the regulations in effect at the time renewal is made. These regulations at the present time require that, "to prevent the spread of prairie or bush fires, the refuse (i.e., the tops and branches ~~until~~ either for rails or firewood) shall be piled together in a heap and not left scattered through the bush." Thus, the situation is adequately provided for, with the exception that there is no policy calling for the enforcement of these specific requirements, and no organization of personnel at the present time adequate to

handle this feature of the work. (See appendix I, Regulations 17b, 17c, and 47).

2. Provision should be made for clearing up old slashings which constitute unusually serious fire hazards. This is especially true as to the Dominion parks, where the scenic beauty is, in some cases, greatly endangered by logging slash on old operations. In some cases, where operations have been completed, or limits abandoned, the cost of this work must, presumably, now be borne by the Government.

3. In order to ensure the perpetuation of the forest, through the adequate retention of seed trees, some additional provision is necessary to secure proper enforcement of cutting regulations on timber limits, both inside and outside of the forest reserves. These areas are under the jurisdiction of the Timber and Grazing Branch. (See Regulation 17a, appendix I).

4. For the future, timber should only be disposed of through timber sales, with a fixed, definite time for the removal of the crop, subject to well-considered and well-understood logging regulations, designed to ensure the perpetuation of the forest. This means the discontinuance of the policy of disposing of timber under the license system, which favours speculative holding and discourages effective control of logging methods.

5. Forest fire protective organizations should be placed under civil service regulations, to ensure an efficient personnel. This is especially necessary as to the Dominion Forestry Branch.

6. A revision is necessary as to the forest fire laws of Alberta, Saskatchewan and Manitoba.

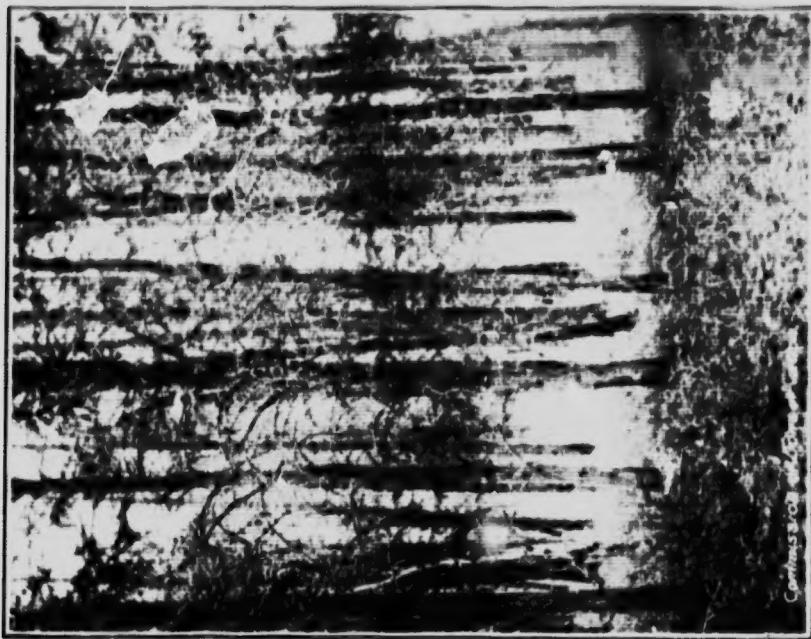
DOMINION FORESTS

Dominion Lands

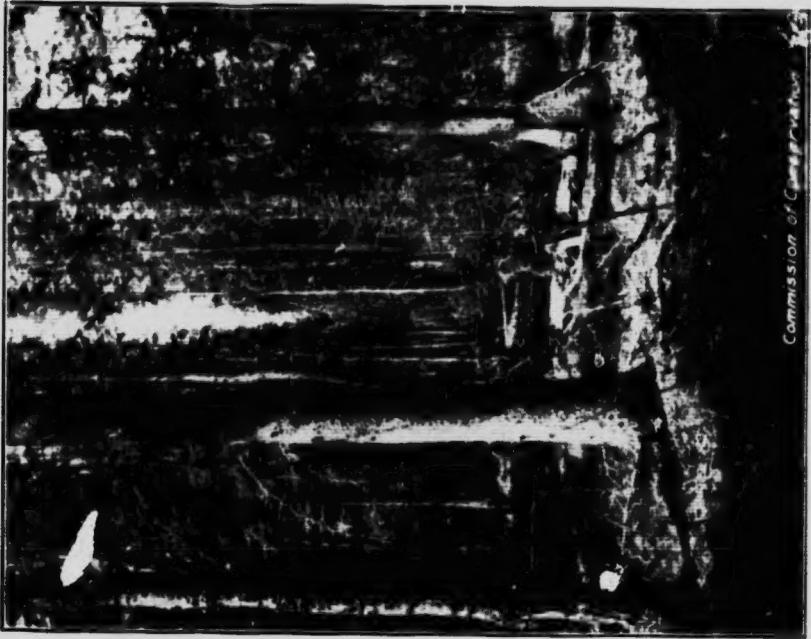
On the organization of Manitoba, Saskatchewan and Alberta as provinces, the Federal government retained the public lands in each case. Hence, with the exception of sales, grants to settlers under various methods of entry, land subsidies to railway companies and to the Hudson's Bay Company, swamp lands in Manitoba, etc., the Dominion owns and administers all land in the Prairie provinces. The alienated portion is naturally, as yet, confined to the southern prairie region. This amounts to some 120,000,000 acres, out of a combined land area of approximately 465,068,798 acres for the three provinces.

In addition, the province of British Columbia, in consideration of the building of the Canadian Pacific railway, granted the Dominion a belt 40 miles wide along the railway and the Peace River block, 3,500,000 acres. Comparatively little of this is alienated.

The lands still remaining the property of the Crown constitute



THE SANDY AREAS OF THE NORTH ARE CLASSIFIED AS THE
JACKPINE TYPE



MATURE SPRUCE-ASPEN TYPE OF NORTHERN MANITOBA,
SASKATCHEWAN AND ALBERTA

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what are known as Dominion lands in the west. Of these, 23,034,640 acres are in forest reserves, 4,657,743 acres are held under license, and 621,299 acres under permit to cut timber.*

Forest Regions Lying between the Laurentian region surrounding Hudson bay and the Rocky Mountain system is a large interior plain of relatively recent geological age.

The northern portion of this plain drains to the Arctic ocean, while the remainder in a general way slopes eastward from the Rockies, with the drainage largely into Hudson bay. This great plain is of a comparatively level, rolling nature, with the surface becoming more irregular as one proceeds westward. Only in a few places are there elevations of sufficient height above the surrounding country to deserve the name of mountains. Most prominent of these is the escarpment running north-westerly through Manitoba from the Pembina mountains. This gives rise to the Riding, Duck and Porcupine mountains.

The southern portion of this plain forms the well-known agricultural prairies of western Canada, extending from the open grassland of the south, through mixed grassland and woodland, to the forested region of the north. It rises in three fairly distinct levels, each of these in turn gradually increasing in elevation westward, from an elevation of about 750 feet above sea-level in the Red River valley, to some 4,000 feet along the borders of the Rocky mountains. This prairie region forms, roughly, a wedge-shaped block adjoining the international boundary, with a width, north and south, of approximately 110 miles in south-eastern Manitoba, and gradually widening through Saskatchewan to 360 miles in western Alberta. This area embraces practically the settled portion of the three Prairie provinces.

Bordering the prairie is usually a wide belt of woodland of nearly pure aspen, which in turn gives way to the northern or sub-arctic forest. This latter is in general a spruce type (white and black), with aspen, balsam poplar, white birch, and balsam fir, as associates. Tamarack and jack pine also occur, the latter occupying the sandy and rocky areas. Much of the area is muskeg.

On the west the prairies are bounded by a forested region of another type, as distinct from the northern spruce forest. This is the lodgepole pine-spruce forest, occurring on the east slope of the Rocky mountains, and which supplies a part of Alberta's lumber cut.

These two forest areas, the one extending across the northern portion of the three provinces, and the other through western Alberta,

*For the location of forest reserves, licensed timber berths and alienated lands, see maps of Alberta, Saskatchewan, Manitoba, and the Railway Belt of British Columbia, issued by the Railway Lands Branch of the Department of the Interior.

together with the railway belt, which is largely forested, constitute, in brief, the region with which this report is concerned. The two latter forests are described later.

Lumbering Industry Although the Prairie provinces are usually associated in one's mind with but one pursuit, namely, farming, the forested portions give rise to a lumbering industry of importance, and, while inferior in development to that of British Columbia or the eastern provinces, are of great value to the immigrant settlement in the west. In 1913 some 188 mills in Manitoba, Saskatchewan and Alberta sawed approximately 250 million feet of lumber, valued at the point of manufacture at over \$4,260,000. Of this quantity, Saskatchewan forests produced approximately two-thirds, Alberta one-fifth, and Manitoba the balance. The prairie market consumes about 1,434 million feet of lumber annually. Over one-half of this comes from British Columbia (in part from the Railway Belt portion), and the remainder is supplied from north-western Ontario, the United States, and the home forests.

The lumber production of these provinces necessarily comes very largely from timber land held under license from the Dominion government. The following table shows the distribution of the lumber cut on Dominion lands in 1912-13*:

Crown timber agency	Manufactured from licensed berths. Feet, B.M.	Manufactured from permit berths. Feet, B.M.	Number of mills operating under license	Number of portable mills operating
Winnipeg, Man.	63,390,156	5,369,438	27	31
Prince Albert, Sask.	121,786,667	2,628,994	4	16
Edmonton, Alta.	14,871,777	11,998,172	24	46
Calgary, Alta.	23,602,764	4,406,796	19	21
Kamloops, B.C.	82,123,038	7,512,175	7	..
New Westminster, B.C.	23,695,365	14,344,060	11	..
Total	329,469,767	46,259,635	92	114

In addition to this 375,729,000 feet of lumber, there were manufactured some 508,000 ties, 50,000,000 lath and 69,000,000 shingles.

That the demand on the Dominion forests is a steady and growing one, and of considerable proportions, is shown by the following two sets of tables:

*These figures, as well as many others in this report, are taken from the *Annual Reports of the Department of the Interior*.

FORESTRY ON DOMINION LANDS

7

MANUFACTURED FROM LICENSED BERTHS

Year	Feet lumber	No. lath	No. ties	No. shingles
1913	329,469,767	48,372,389	342,138	49,876,315
1912	240,863,681	18,343,253	300,215	49,801,000
1911	203,239,661	18,957,193	200,989	37,948,000

MANUFACTURED UNDER PERMIT

Year	Feet lumber	No. lath	No. ties	No. shingles
1913	46,259,635	1,916,548	165,908	18,844,750
1912	53,984,974	4,624,014	138,581	558,500
1911	27,347,629	478,741	18,520	630,000

Besides the preceding figures of the lumber industry, the following additional timber material was cut, under the permit system, principally by homestead settlers:

Material	1913	1912	1911
Lumber and logs, ft., b.m.....	51,486,216	44,617,680	65,408,595
Roof poles, pcs.....	1,346,995	1,638,660	1,446,595
Fence posts, pcs.....	1,905,735	2,438,659	2,704,721
Fence rails, pcs.....	5,157,420	6,416,326	5,102,625
Cordwood, cords.....	169,011	196,530	186,838
Mine props, lineal feet.....	848,800	264,539	35,000
Shingles, pcs.....	8,000	25,065,000	30,852,000
Ties, pcs.....	1,485,952	2,019,916	1,015,150
Telephone poles, pcs.....	35,031	54,052	23,038
Lath, pcs.....	1,047,900
Piling.....	224,430

In the last 40 years the receipts on account of Dominion lands have amounted to approximately \$40,000,000. Of the various sources of this revenue, that of sales of land naturally has been the largest, but this source must eventually give out. The forests rank third, the timber dues, etc., in that time totaling about \$6,000,000. These exceeded \$463,000 in 1912-13, and have averaged over \$390,000 annually for the last ten years.

The above considerations go to show the importance to the community of the forests on Dominion lands in the west, an importance which demands their conservation, by adequate protection from fire and by regulatory control of logging operations after modern methods.

FOREST CONDITIONS ON DOMINION LANDS IN MANITOBA

The province of Manitoba contains approximately 147,000,000 acres of land. Of this, some 27,000,000 acres in the south have been surveyed, to meet the demands of settlement, and the bulk of this has passed into private ownership. The alienated portion occupies, in a general way, the area north from the international boundary for about 110 miles on the east, gradually widening to about 225 miles at the western boundary of the province. The northward extension of settlement is at present largely taking place in the region lying between lake Manitoba and lake Winnipeg.

The remaining unsurveyed acreage belongs mainly to the Dominion government. The region is imperfectly known, as regards its possible industrial uses, but it is expected that not more than one-sixth of it will prove suitable for agriculture, and to that extent it will in time be alienated from the Crown. The larger portion of the province consequently is unsuitable for farming. Of this an unknown proportion is suitable only for supplying wood products, and will undoubtedly in time be set aside for that purpose. The present discussion, however, is concerned only with the forest reserves and timber berths already in existence.

**Timber
Berths**

The timber berths in 1912 covered an area of 1,235 square miles under license and 365 square miles under permit regulations, a total of 1,024,000 acres. These berths are situated, mainly, on the Winnipeg river, around the shores of southern lake Winnipeg, the northern portion of lake Winnipegos and the series of lakes north of it (Cedar, Moose, Cormorant and Goose lakes), and within the Porcupine Hills reserve and the southern half of the Duck Mountain reserve. Lumbering in Manitoba has been in operation since a very early date, and the cut now is relatively small, being only around 50,000,000 feet annually. The lumber is practically all white spruce (to the extent of 90 per cent), with small quantities of poplar, tamarack, jack pine and white pine. The market is local.

**Forest
Reserves**

Some 20 years ago the Department of the Interior decided upon the advisability of setting aside areas of non-agricultural land as sources of future timber supply in the west. Naturally this policy was first carried out in Manitoba, and in 1895 the Riding Mountain, Spruce Woods and Turtle Mountain reserves were set aside. The policy was continued until now the

reserved areas aggregate 4,108.5 square miles (2,629,440 acres). The complete list is as follows:

Riding Mountain reserve.....	1,535	square miles
Duck Mountain No. 1 reserve.....	1,462.25	" "
Porcupine No. 1 reserve.....	777.5	" "
Turtle Mountain reserve.....	109.25	" "
Spruce Woods reserve.....	224.50	" "
	4,108.5	square miles

The more important of these are the first three, situated along the rough, abrupt escarpment in western Manitoba.

Riding Mountain Reserve

Next to the Rocky Mountains and Lesser Slave Lake reserves, this is the largest so far created, comprising nearly 1,000,000 acres. It is a rolling plateau-like region, rising in its highest portion about 1,000 feet above the surrounding country, and giving rise to numerous rivers flowing north, east and south. On account of the rough topography and boulder-strewn nature of the soil, the area is unsuited to agricultural use.

The reserve has been logged over and has also suffered severely from fires in the past, so that to-day less than 25 per cent of the area can be described as timbered.* Some two-thirds of the reserve has been overrun by fire once or oftener. As a result the prevailing type is poplar, mostly aspen (white poplar), with balsam poplar (black poplar) where drainage is slower. The poplar stands are of all age-classes, in accordance with the dates of the fires they followed. In many cases, due to repeated fires, the stands are too open to produce anything better than fuel; but in close stand the trees at maturity reach a height of from 70 to 90 feet, with a diameter of 12 to 18 inches, and free from limbs. Many stands are over-mature, since the lumber industry does not as yet utilize poplar to any extent; these older stands occur mostly along the eastern side of the reserve. Both species of poplar are much subject to fungus defect, a large percentage of trees on approaching maturity showing evidence of attack by the false tinder fungus.

Where the fires have been less severe white spruce is found, mixed with the poplar, or else scattered throughout in small pure stands. These latter areas are the only ones suitable for logging, however, and aggregate but a small percentage of the total.

The poplar and poplar-spruce types occupy the richer and better drained soils. The poorly drained muskegs, covering over 15 per cent of the reserve, carry a stunted growth of black spruce and tamarack,

*The figures here used are taken from *Bulletin 6* of the Forestry Branch, which gives a detailed description of the reserve.

fit only for fuel. The few sterile, sandy stretches are occupied by jack pine; most of it has been burned over, so the present stands are young.

In addition to the species already mentioned, there is a minor mixture of white birch along with the aspen and spruce, and of balsam fir in the wetter spruce stands. There is also a sparse occurrence of bur oak, green ash, American elm and Manitoba maple. Small open grassland areas occur, where fires have been most frequent.

The present stand of saw timber on the reserve is estimated at about 200,000,000 feet, board measure. Over one-half of this is poplar (largely aspen), with spruce next in order, and the other species each forming but a small percentage of the total. Logging operations on licensed berths in the past have been confined to spruce, and this is pretty well exhausted. The cut from these berths for the last two years aggregated but 2,500,000 feet. Practically all the commercial spruce remaining on the reserve is under license. So far there has been very little market for poplar lumber. The tamarack, on account of its small size, is of most value as fuelwood.

While the reserve has little value at present as a source of general saw-mill supplies, it is of vast importance locally for building and fencing material, fuel, etc. This is shown by the following statement of material cut from the reserve under settlers' permits:

Material	1912	1911	1910
Lumber, feet, b.m.	3,794,613	2,268,663	2,871,110
Building logs, lineal feet	15,590	10,466	22,755
Cordwood, cords	4,515	3,704	2,878
Fence posts, pcs.....	17,550	25,030	43,400
Fence rails, pcs	17,320	9,600	
Roof poles, pcs	8,000	4,700	41,600

This was roughly 5,000,000 board feet of material in all, average per year, apart from the lumber removed under license. The material was probably three-quarters spruce.

Other Reserves

North of the Riding Mountain reserve lie the Duck and Porcupine reserves. These have a forest cover similar to that just described, but have probably suffered less from fire and have a greater proportion of spruce stands. A considerable area in each is still under license.

About 15 miles east of Brandon is a small reserve known as the Spruce Woods. This is a light sand area, with a scattered growth of spruce, except for a small low-lying portion with tamarack. Considerable work has been done on this reserve in reforesting.

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CORDWOOD PERMIT OPERATIONS (JACKPINE) IN NORTHERN SASKATCHEWAN
The regulations regarding brush disposal were enforced.



AN ADJOINING OPERATION
In this permit area the regulations were not enforced.



The Turtle Mountain reserve consists of a block of some 70,000 acres, lying south of Boissevain, along the International boundary. Owing to excessive cutting and repeated fires practically no mature timber remains. The whole reserve has been burned over, with a resultant reproduction of poplar and birch, and a scattering of the other Manitoba hardwoods. No conifers occur. At present it affords fuel and hay to local permittees, and stock grazing is permitted on certain portions. The reserve is also used as a summer resort.

**Suggested
Management**

In the utilization of the aspen and the regeneration of the more valuable spruce must lie the future of the Riding Mountain reserve and those to the north of it. As already said, poplar lumber is but little in demand, yet there were 4,700,000 feet of it sawed in 1911 in the provinces of Manitoba, Saskatchewan and Alberta. With the gradual exhaustion of spruce supplies in the middle west, attention will be turned to poplar as a saw timber. But it is not as useful a species. In the log it is a poor floater, the wood is soft, weak and very perishable in exposed situations. The lumber warps and checks badly and cannot be obtained in large sizes. However, owing to its great abundance in the west, poplar will eventually have great value for certain uses, in which its inferior qualities and small size do not matter. It is an excellent fuelwood, is satisfactory as boxboard material, and its toughness makes it suitable for stable and barn lumber. In north-eastern America it is chiefly used for excelsior and paper pulp, in the latter use ranking next to spruce and hemlock.

The aspen makes an excellent nurse tree for the young, more slowly growing spruce. Its light foliage protects the young growth, and the tree must play an important part in improving the quality of these forests in the future. In the interests of the reserves, all encouragement should be given the spruce by restrictions on cutting; at least, settlers should be prohibited from cutting the remaining spruce under permit, since poplar will meet most of their needs. The yearly cost of administration of these reserves would not be increased by the adoption of a policy to gradually alter them from poplar forests to spruce.

FOREST CONDITIONS ON DOMINION LANDS IN SASKATCHEWAN

The province of Saskatchewan not only leads the Prairie provinces in the production of wheat and oats, but also of lumber. Its lumber cut in the north much exceeds that of the other two provinces combined, 23 mills in 1912 reporting a total cut of 157,255,000 feet board measure, worth \$2,535,600 at the mill. This was nearly all spruce.

Some jack pine is cut, and this is usually thrown in with spruce. A little tamarack is also cut, for stable flooring, inside finish, and door frames, but as a rule the trees are too small to be sawn.

Timber Berths The area under license in 1911-12 was 2,145 square miles, and under permit 310 square miles. The licensed berths lie, roughly, in two regions. One of these is the territory for the first 75 miles of the Canadian Northern railway west from the Manitoba boundary, extending south of the line some 45 miles and north to the Saskatchewan river. The remaining berths lie largely in a belt of country 50 miles wide, stretching northwest from Prince Albert 100 miles. Very few berths under license are within the forest reserves, these containing little merchantable timber. The timber is of the northern spruce type already described.

Forest Reserves In the province of Saskatchewan eight reserves, totaling 1,800 square miles, have been created. Of these, Duck Mountain No. 2 and Porcupine No. 2 are the portions of the rough, hilly region of western Manitoba lying outside that province; these have been already described. Moose Mountain and Beaver Hills are two small reserves with much slough land, in the south-eastern portion of the province. Both have the usual history,—stripped of timber and overrun by fire, and now carrying a reproduction of poplar, mostly immature. Their value is local, for fuel, fencing material, and such like. Planting will be necessary for conversion to conifers.

Of the remaining reserves, three large ones are situated around Prince Albert. These are the Nisbet, bordering the North Saskatchewan river; the Pines, southwest from the city, between the North and South Saskatchewan rivers; and Fort à La Corne, extending eastward from the junction of the same two branches.

These three reserves are very similar in character of soil and tree growth, and of a type very different from the Manitoba reserves. They are in general sandy tracts, with much swamp and muskeg interspersed. This sand has a very thin layer of humus, only locally exceeding an inch in depth, which would be readily exhausted by two or three crops, and so is unsuitable for farming except under continued fertilizing. Wherever the sod is broken the tendency to become blow sand is very evident.

The characteristic tree is jack pine, here near its centre of optimum development, and reaching good tie size at maturity. It occurs mostly in pure even-aged stands, and many mature blocks of limited area occur, especially on the Fort à La Corne and Nisbet reserves. The

majority of the stands, however, are immature. Fires have swept over a large proportion of the dry sandy sites and have done much damage. However, as the species reproduces well on burns, the forest condition is satisfactory, except where repeatedly fire-swept. Under such circumstances park-like stands result, with limby, damaged trees, useful only for fuel; in extreme cases open grassland is formed.

The older trees are very widely attacked by a parasitic dwarf mistletoe (*Arceuthobium americanum*), whose presence is indicated by the formation of abnormal bushy masses of branches known as "witches' brooms." These interfere very seriously with wood production, and may in time kill the tree. To prevent this it is necessary to eradicate the affected trees. It is highly desirable that the removal of such trees be favoured by reduced dues. The younger trees are destroyed by rabbits during the winter of 1912-13.

The better soil areas are, of course, occupied by spruce and balsam poplar in the moister places; these, however, is secondary. The drier swamps are occupied by spruce and tamarack, mostly of small size; this is reduced to a border

These reserves have been largely cut over for tie timber, and for the present they will be of value mostly as a source of local fuel supply, especially in the case of those near Prince Albert. If these are kept out, the future of the forest growth is assured, on account of the persistence of the jack pine. The Pines and the Nisbet are well supplied with trails and surrounded by settlements. Those populations are being rapidly cleared up, present scope for improvement of settings; while the burns which are not restocking offer very favorable opportunity for successful planting.

FOREST CONDITIONS ON DOMINION LANDS IN ALBERTA

The spruce forest of Manitoba and Saskatchewan continues across the northern end of the prairie region of Alberta, finally mingling with the Rocky Mountain forest of the western portion of the province. In both these forest regions timber berths and forest reserves are in existence.

Timber Berths Licensed lands in 1912 totaled 2,174 square miles, and lands held under permit, 40 square miles. Probably one-third of the licensed area lies within the Rocky Mountains reserve described below. The other berths are scattered along the North Saskatchewan and its tributaries below Rocky Mountain House, along Athabasca waters, and on Peace River tributaries

southwest of Lesser Slave lake. These are similar in composition those in northern Saskatchewan, except for the more westerly situated ones, which have more or less of an inclusion of Rocky Mountain species. The lumber cut, largely from Dominion lands, approached 50,000,000 feet in 1912, with 90 per cent of it spruce. Small quantities of pine, poplar, Douglas fir and tamarack comprised the balance.

Rocky Mountains Forest Reserve The forest reserves of Alberta cover 26,112 square miles, or nearly three-quarters of the total area of the province aside as Dominion reserves. The largest and most important of all is the Rocky Mountains reserve. This immense reserve, of over 13,000,000 acres, recently created, is situated along the east slope of the Rocky mountains, extending in a north-westerly line from the International boundary some 450 miles. It includes the lands which, owing to the character of the topography and soil and to the elevation, is unsuitable for any form of agriculture beyond local interior grazing areas. In a general way the eastern boundary follows a line in the foothills at about 4,000 feet elevation, the line being raised or lowered according to regional conditions. South of the Crownsnest branch of the Canadian Pacific railway the width of the reserve is only some 10 or 15 miles. Northward it widens more or less, gradually reaching a maximum breadth of about 85 miles south of Jasper park, and again narrowing down as the Peace River drainage is reached.

Within the reserve certain areas have been proclaimed park and game preserves, notably Rocky Mountain park, comprising a tract of 1,740 square miles, north and south of the Canadian Pacific Railway line, and Jasper park, 1,200 square miles,* along the Grand Trunk Pacific railway.

The remainder of the reserve, for forest administrative purposes, is divided into five units, known as the Crownsnest, Bow River, Clearwater, Brazeau and Athabasca forests. The first two of these include the mountain sources of the South Saskatchewan river; the Clearwater and a portion of the Brazeau, those of the North Saskatchewan, while the remaining forests include headwaters of the Athabasca and Peace rivers. Thus the reserved slope is the source of the great Saskatchewan system of the prairies, draining to Hudson bay, as well as of a portion of the Mackenzie system which drains into the Arctic.

The Saskatchewan drainage system, in its entirety totaling some 154,500 square miles, embraces the major portion of the settled area

*Enlarged in June, 1914, to 4,400 square miles.

of the Prairie provinces. The importance of preserving the forest cover at the source of supply, to ensure an even flow during the year throughout this vast region, can scarcely be overestimated. The two westerly provinces are not endowed with a liberal water supply, and the denudation of the east slope of the Rockies, with consequent rapid run-off, would undoubtedly necessitate the construction of huge storage reservoirs.

In addition, the east slope is largely underlain with coal deposits, estimated by the Geological Survey at over 22,000 million tons. In the development of these areas the forest will play a very important part, to say nothing of the future supply of lumber products in general.

The reserve in the past has been extensively and severely burned at different periods*. The survey party engaged in determining the eastern boundary, from the Elbow river south, during 1910, estimated that at least 60 per cent of their territory had been fire-swept within the past 60 years. The party working north arrived at a figure of 75 per cent burned between the Elbow and North Saskatchewan rivers. A study in 1908 of the Crowsnest River valley, between the Livingstone range and the continental divide, showed but 16 per cent of the 212 square miles involved as unburned; and of the burned area nearly one-half was not restocking. South of the Crowsnest river little timber has escaped fire, outside of the valley bottoms.

North of the Crowsnest, to the Bow river, the reserve suffered very severely in 1910; this was prior to its organization. In the Porcupine hills an area of some 50 square miles was devastated. The valley of the north fork of the Oldman river (Livingstone) was all burned, with the exception of the headwaters of the west branch. The valley of the Highwood river was burned to the extent of some 150 square miles, and some 50,000,000 feet of fine spruce timber killed. The Elbow River valley was cleaned out entirely, as well as the adjacent prairie country. The Kananaskis valley was largely burned, and at the headwaters of the Little Red Deer river a tract of about 110 square miles was overrun. It is estimated that the fires of 1910 ran over at least half a million acres of the reserve south of the Red Deer river, and destroyed some 200,000,000 feet of merchantable timber.

Although north of the Red Deer comparatively little was burned in 1910, except east of the reserve, very extensive fires, mostly dating 25 to 50 years back, have occurred throughout the region. From the James river to the Clearwater river all has been burned over in the vicinity of the eastern boundary. The Saskatchewan valley has been

*The following fire data are taken from various Forestry Branch bulletins and reports, together with information supplied by the district inspector for Alberta.

burned as far west as Mire creek. The Clearwater forest appears to have suffered less than the others, due no doubt to its remoteness from civilization. The Brazeau and Athabaska forests have also experienced large fires, but to what extent is imperfectly known.

Three-fourths of the forest area of the reserve, it is estimated, has been burned over at various times, mostly within the last 60 years, so that the majority of the stands are "second growth," below timber size. These are almost always lodgepole pine, and as this species forms more than one-half of the mature stands as well, it may be said to characterize the east slope.

(1) *Mature Stands.*—The mature stands of timber occur largely as isolated areas which have escaped fire. Along the margin of the foothill country and occasionally in the interior, stands of Douglas fir occur, but these have been so reduced by fires from the adjoining prairie as to be relatively unimportant. The majority of the mature stands consist almost altogether of three species—lodgepole pine, Engelmann spruce, and white spruce—all of commercial importance. They occur either as pure or mixed stands. North of the Bow river the mature timber is very largely pine.

The mature pure spruce stands occupy the valley bottoms and lower slopes, while the pure pine stands are largely restricted to the upper and steeper slopes. The intermediate slopes are covered with mixtures of pine and spruce in varying proportions. This altitudinal distribution is related to the depth of soil and drainage, the spruce requiring a moist, well-drained soil, whereas the pine can thrive on a drier situation. Tree growth ceases at about 7,000 feet, due to lack of soil and other physical conditions obtaining, rather than to the climatic conditions.

On the upper slopes the soil is too poor for the production of large trees, and the merchantable timber is confined to the lower slopes and the deeper soils of the intermediate slopes. The accessible stands are virtually all under license at present. Originally the best spruce probably occurred in the Highwood and Crowsnest River valleys, where a maximum size of three feet in diameter and over 100 feet in height was attained. The present stands consist of trees mostly 10 to 18 inches in diameter. Pine, on the best sites among spruce, reaches a diameter of two feet, but in pure stand it only averages 8 to 14 inches. Logging has so far been carried on mostly for spruce, on account of its larger size, the average log from government returns showing a content of 50 board feet. Both species of spruce produce lumber of identical qualities. The pine, though shorter than the spruce, possesses a less tapering stem, with a greater clear length, and, since it also produces a clearer lumber, with a more pleasing grain, it will in time

receive due attention. The timber in the northern portion of the reserve is of slower growth, and in general reaches a smaller development at maturity.

(2) *Immature Stands.*—The immature stands, originating after fires, as already stated, constitute three-quarters of the forest growth on the east slope. These stands are practically always lodgepole pine. Only under exceptional circumstances has a reproduction of spruce followed the fire; on the prairie border poplar usually results.

This predominance of lodgepole pine over spruce in the reproduction following a fire is due largely to the difference in fruiting character of the two species. The cones of lodgepole pine remain on the tree for many years, opening slowly to discharge the seeds, while those of spruce open at maturity and shed the seeds within a short time. In addition, lodgepole pine seeds retain their germinating power for a longer period. A ground fire, therefore, which destroys the spruce seed, merely serves to release the accumulated seed supply present on the pine trees, since the heat opens the cones. Also, spruce trees are more readily killed by fire than lodgepole pine, and so their chances of escape to function as seed trees are less. In general, spruce reproduction follows only in the case of very light burning, and where neighbouring seed trees are left; the light burning does not destroy the litter and humus and lay bare the mineral soil, and pine does not germinate as well as spruce with such seed bed conditions.

The second growth stands of lodgepole pine are characterized by their great density, and by their evenness of age, each dating from a particular fire. Owing to the severity of the fires, a bare seed bed is prepared on which the stored-up crop of seeds rapidly falls. The result is a direct stocking up with altogether too dense a growth of seedlings. The young trees hinder the development of one another, so that a longer time is needed to reach merchantable size.

**Lesser
Slave Lake
Reserve***

This is a newly-created reserve, of some 5,000 square miles, situated mostly south of Lesser Slave lake. In general, it presents a rough broken topography, with large, poorly-drained areas aggregating over one-quarter of the whole.

The reserve embraces a variety of forest types, of which the lodgepole pine type is the most important from the standpoint of area. Although it covers over a million acres of the valley slopes of the Swan hills, the bulk of the forest is of a dense spindly growth, which will never reach more than pulpwood size.

Almost as large an area is represented in the poplar type, mostly as a result of fires. In this type aspen predominates, with a mixture

*The following description is based on *Bulletin 29*, Forestry Branch.

of balsam poplar, along with a scattering of the other northern species. Both poplars are very defective, materially reducing the yield of wood.

The remaining forest types cover relatively small areas. Jack pine, as usual, appears on the sand ridges, the majority of the stands being immature. The merchantable white spruce occurs in localized patches as the remnants of larger fire-swept areas. The undrained locations carry the usual stunted black spruce and tamarack.

While the present stand of mature timber on the reserve is small, being estimated at some 350,000,000 feet of saw timber, 4,000,000 cords of pulpwood, the potential crop is important and will be a source of supply for the future neighbouring settlement, which is undoubtedly develop. In addition, the forest growth is essential for the proper regulation of water-flow in the main drainage streams, these are navigable streams, upon which this region is dependent for intercommunication. At present no management is feasible beyond protection from fire.

Other Reserves The Cooking Lake reserve is a small area of very broken land, with much muskeg, situated about 15 miles east of Edmonton. It has suffered extremely from fire, so that practically all the original conifers are gone. The usual poplar reproduction prevails, but considerable areas will need to be replanted. The northern portion is set aside as Elk park.

The Cypress Hills, another small reserve, lies in south-eastern Alberta, extending into Saskatchewan. The eastern portion is forested, but the western portion has been reduced to grassland by fires. It is the most important elevation in a region where irrigation farming is practised, and hence is very important in the conservation of water supply. As the only source of local wood supply, it has likewise great value.

FOREST CONDITIONS ON DOMINION LANDS IN BRITISH COLUMBIA

Dominion lands in British Columbia comprise a strip of land 50 miles wide on either side of the main line of the Canadian Pacific railway (known as the railway belt), the Peace River block of 3,500,000 acres, and some 50,000 acres of coal lands in the Crowsnest region. These were provincial grants to the Federal government, associated with early railway construction.

The Railway Belt

The railway belt, in its stretch of over 500 miles, may be said in a broad way to traverse an interior mountainous plateau, lying between the Rocky mountains on the east and the Coast range on the west. The region is one characterised

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TYPICAL SLASH AFTER A LUMBERING OPERATION

In Rocky Mountains National Park, within a few miles of Banff. Fire started in this
would quickly be beyond human control.



AREA LUMBERED 12 YEARS AGO

Owing to the dry climate it will be another decade or more before the slash will have decayed
and the fire hazard be thus removed. Spruce-pine type. Rocky Mountains Reserve.



ized by a very rugged and diversified topography, being, in fact, a vast complex group of ridges and mountains. Probably less than ten per cent of the railway belt is adapted to agricultural use of any kind.

Owing to its unsuitableness for agriculture, but a comparatively small portion of the railway belt has been alienated by the Dominion government. There were some alienations by the Province prior to the transfer. Outside of straggling areas along the railway line, and in many of the river valleys, the lands disposed of fall roughly into two regional blocks, aggregating some 150 miles in an east and west direction. One of these comprises the country between Sicamous and Kamloops, largely south of the line of railway; while the other is found from Agassiz westward. In the central dry region some 400,000 acres are under grazing lease.

The country is essentially a forested one, with the tree flora exhibiting many species largely absent east of the continental divide. Characteristic among these may be mentioned the Douglas fir, and the western species of cedar, hemlock, white pine, yellow pine, tamarack (local), together with some others restricted to the vicinity of the coast.

Climatically, the railway belt may be roughly divided into three regions, on the basis of precipitation. The coast region is characterized by a humid atmosphere and heavy rainfall, and again in the Gold and Selkirk ranges an abundant fall of rain and snow occurs. Between these lies a sub-arid region, locally known as the "dry belt."

The types of forest growth present are related very largely to this difference in annual precipitation, those tree species requiring at least a fair amount of moisture being absent from the intervening dry region. Within each broad regional type much variation is, of course, encountered, in keeping with the effect of the varied topography on moisture conditions.

Regional Types.—The lodgepole pine-spruce type of the east slope continues on the seaward side of the divide, with both species here reaching a greater development. Westward, gradually an inclusion of Douglas fir, hemlock, cedar and western white pine appears, but these are of minor importance till the summit of the Selkirks is reached.

From the Selkirk divide to somewhat west of Adams and Shuswap lakes the so-called "wet belt" extends, with a precipitation of 56 inches at Glacier in the Selkirks, and 35 inches at Griffin lake in the Gold range, as compared with 25 inches at Donald. Here, for the first time, typically, western white pine appears commonly, and cedar, hemlock and Douglas fir attain commercial importance. These are all species whose development is favoured by a plentiful supply of

moisture. Lodgepole pine and spruce, especially the latter, are still abundant. Usually the valley bottoms and lower slopes carry spruce, cedar, hemlock, western white pine and Douglas fir, with the first three predominating. The higher slopes are generally clothed with white pine, Douglas fir, lodgepole pine and spruce, with lodgepole pine probably the commonest. The timber line consists of spruce, alpine fir, whitebark pine and alpine larch. The occurrence of spruce throughout is noticeable.

Westward, from about Shuswap lake, an arid belt, with a precipitation of only 10 inches at Kamloops, is encountered for some 175 miles, to the vicinity of North Bend. The tree species are much reduced in number, the characteristic tree being the western yellow pine or bull pine. It occupies the lower elevations, and in many localities forms very open non-commercial stands. Altitudinally it is succeeded by Douglas fir, a species adapted to a variety of soils and climate, but here of proportionately poorer development. A belt of lodgepole pine is usually to be found above the fir, or occasionally spruce.

The forest of the remaining portion of the railway belt is of the well-known lower coast type, Douglas fir, hemlock and cedar being the main species. With abundant moisture, both soil and atmospheric, all three reach their maximum size, resulting in very heavy stands of timber. In addition, some new species enter the flora, notably tideland spruce, lowland fir and lovely fir, likewise important timber trees.

Timber Berths.—Outside the arid section, the railway belt shows a large number of timber berths under license, these comprising about 1,800 square miles. They are located largely on the Columbia river and its tributaries, in the Shuswap Lake region, and from the vicinity of Harrison lake westward to the coast. A map showing the timber berths practically depicts the accessible stands of mature timber. Despite the large area, less than 75,000,000 feet of lumber was manufacture in 1911-12 from these licensed berths. This was increased probably by about one-third last season, owing to the necessity of utilizing burned timber. The licensees operate mainly in provincial timber. The reason would appear to be the low ground rent charged by the Federal government, as contrasted with that of the province, this favouring the holding of timber for speculative purposes.

Forest Reserves.—Reservation of forest land began in 1888, with the setting aside of Glacier park, followed by Yoho park in 1901, and the Long Lake reserve in 1902. In 1906, six more reserves were created, and during the present year (1913) four others, with additions to some of those already formed. At present the thirteen forest reserves comprise a total of 3,782 square miles.

With the exception of the two parks in the eastern portion of the railway belt, the forest reserves are located in the interior dry region. This has received first attention from the forestry officials, owing to the relatively great importance of water supplies. The reserves form two east and west belts, north and south of the railway line respectively, exclusive of the valley bottom lands. Agriculture in the district requires irrigation for success, the supply coming from the small mountain streams. In the conservation of this supply by the forest cover on the watersheds of these streams lies the main value of the reserves at present. The timber, in comparison with that outside the "dry belt," is now unimportant, and practically no logging operations are being carried on within the reserves. Improvement, with a view to increasing the efficiency of protection from fire, must constitute the main managerial care for some time.

Squatting.—Owing to the scarcity of agricultural land, and the general reservation, for some years, from homestead entry of Dominion lands except within the sub-arid region (pending contemplated changes of land policy) the squatting evil exists throughout the railway belt in a somewhat marked degree. This has an important bearing in connection with forest conservation. It is the old-time story of the clash between the interests of the lumberman and those of the settler. The lumberman is charged with holding, for speculative purposes, timber on agricultural soil, or holding under license logged-over lands which should be opened for settlement. On the other hand, the settler is charged with squatting on land chiefly valuable for its timber, and endangering timber limits by his careless use of fire in clearing land. Apart from the aspect of the defiance of law, the most undesirable feature of squatting in a forested region like the railway belt, lies in the increased difficulty of protecting timber from fire. Settlers as a whole do not give a forest protection policy their strongest support while they feel that the presence of timber on agricultural lands prevents its opening for settlement.

The condition of affairs may be remedied by increasing the land available for entry. This could be done by requiring operation on such licensed areas as are agricultural soil and adjacent to settlement. This would require to be done after due notice, in order not to disarrange business interests. Logged-over limit areas should be examined systematically, as operations are finished, for classification as to agricultural or forest lands, and in the former case opened for homesteading as the demand necessitates. With sufficient agricultural land made available for settlement, the government could enforce the regulations forbidding squatting on timber berths, and reduce the fire risk accordingly.

FOREST PROTECTION ON DOMINION LANDS

The extremely important duty of protecting the forests on all Dominion lands from fire, with the exception of Dominion parks, lies with the Forestry Branch of the Department of the Interior. Two separate organizations, enforcing different regulations, are in charge of the work, one guarding the forest reserves and the other all Dominion forest land outside the reserves. In both organizations the method in use is that of a patrol system.

Within Forest Reserves.

The protection of the reserves depends upon the forest rangers, who perform this work in conjunction with their other duties. To each forest is allotted a certain number of rangers, each of whom is in charge of a specified territory, and responsible for the same to the superior officer administering the business of the forest. The size of the district varies according to the fire risk and accessibility to movements of the general public. The duties of the rangers consist in a patrol of the district, to enforce the regulations made under the Dominion Forest Reserves and Parks Act, and to put out fires. In wet weather they are engaged on permanent improvement work, such as building roads, trails, telephone lines, and ranger cabins. The wages are \$75 to \$100 per month. Licensed and unlicensed portions of a reserve receive the same attention.

The forest reserve regulations relating to fire protection are very complete. On the reserves, a closed season for fires exists from April 15 to October 31, and this period may be extended, if deemed advisable, in the case of a summer of special danger. During this season no fires, except camp fires, may be set, unless a permit be obtained from a forest officer. Also, the regulations and penalties of the province in which the reserve is located are applicable to the reserve. Full precautions are taken with reference to railway lines being operated within reserves. Most of the railway companies whose lines pass through reserves are already under the authority of the Board of Railway Commissioners for Canada, which requires special patrol by the companies where material fire danger exists. Those not under its jurisdiction are subject to a similar reserve regulation requiring patrol as specified by the department.

These provisions are ample, consequently the efficiency of protection is a matter of personnel. This will be discussed later.

Outside Reserves An enormous area of Dominion lands exists in Manitoba, Saskatchewan, and Alberta, the northern portion of these three provinces which is not included within any reserve. It is not all timbered, to be sure, much muskeg occurring, but the forested areas are numerous and valuable, including many licensed timber

berths. It is a frontier country, bordered by the advance line of settlement, busy clearing land by fire, with railway and highway construction in progress, and constantly travelled by prospectors, freighters, trappers, surveyors and campers. The task of protecting it from fire is correspondingly difficult.

The whole territory, under the administration of a Dominion inspector of fire ranging, is divided into nine districts. These are organized, as regards location and intensity of patrol, according to the nature of the country and the fire risk, as indicated by man's activities. Each district has a staff of fire rangers, in charge of a chief ranger, who has no other duties. The rangers are engaged in patrol work exclusively from May till November, temporary men being taken on during the more dangerous periods. About 115 men, exclusive of chiefs, were employed in 1913.

During the past season, in Manitoba, the south-eastern portion of the province with the north half of the peninsula between lakes Manitoba and Winnipeg, formed one district, the water routes, from the foot of lake Winnipeg to Hudson bay, another district, and the country around The Pas, including Hudson Bay railway right-of-way patrol, a third. Approximately 55 rangers were employed in these three districts. In Saskatchewan, the region protected was in a general way that along the Canadian Northern railway, extending on the north side to Saskatchewan river, Montreal lake and Beaver river. This was subdivided into three districts, with Hudson Bay Junction, Prince Albert, and Battleford as centres. The ranger staff about equalled that in Manitoba. In Alberta, attention was centred on the large territory from Red Deer and Rocky Mountain House north into the Peace River country, and the northward route of travel down the Athabasca river from Athabasca Landing. A patrol boat was used for the portion between Athabasca Landing and Grand Rapids. A total of some 45 rangers was required in Alberta.

In these sparsely settled districts little can be done in the way of fighting fire, as aid is not available. The prevention of fires is all the more important, and the rangers are thus called upon to do much patient work in educating the people as to fire damage and the law. The fire act at their disposal is that of the province in which their district lies. Manitoba has one act, Saskatchewan and Alberta another, and the Dominion government simply enforces the provincial fire laws.

Unfortunately, these fire laws are inadequate, as legislation, to prevent forest fires. Both are old legislative measures, that of Saskatchewan and Alberta dating back 15 years, and that of Manitoba 18 years. At those dates settlement was restricted to the south, away from the forested parts, and the fire legislation was designed primarily

for the prevention of prairie fires, which frequently swept over the country, destroying the homesteaders' buildings and crops. Since that time the occupation of land has been pushed forward to the border of the northern forest, through which travel has increased greatly and the fire danger likewise. It is but natural that the old provisions, made for open prairie conditions, should not be the most effective for preventing forest fires. This prevention, with a mere handful of men, is difficult enough, even when backed by favourable laws. All modern legislation recognizes the principle of the closed season, during which a permit to set fires is necessary; further, since securing a conviction is so difficult, the present tendency is to put the onus of proof on the defendant that he has complied with the law. As to these points, the fire laws of the prairie provinces are deficient. Forest fire legislation in Canada has made rapid strides in the last decade, and the Prairie provinces cannot afford to lag behind. New forest fire acts, framed to meet the sources of danger, and having relevance to the northern portion, are urgently needed.

Another important branch of the forest protection system, and separate from the patrol organization just discussed, lies in the inspection of the protective work done by the railway companies under regulations issued by the Board of Railway Commissioners by virtue of the authority of the Railway Act of Canada.

In brief, these regulations relate to the use of fire protective appliances on locomotives, the regulation of fuel, the construction of fire guards, the clearing of rights-of-way, and the establishment of a special patrol of the railway line from April 1 to November 1, as specified by the chief fire inspector of the Board. The burden of proof is placed upon railway companies to extinguish fires starting within 300 feet of the track, unless the company can show that the fire was not caused by the railway, and all regular employees are required to report the discovery of all fires on or near the right-of-way, and to take steps to extinguish them. The principle throughout is that the railway companies themselves must undertake the work of protecting the public against damage by railway fires. The legislation is easily the most efficient in America, and affects all railways in operation or under construction which are under the jurisdiction of the Board of Railway Commissioners.

The inspection looking to the enforcement of the regulations is in charge of the fire inspection department of the Board. This department is assisted by the appointment of certain outside forestry officials as officers of the Board, without additional pay, to supervise the detailed field inspection. This work in Manitoba, Saskatchewan, and Alberta, outside the forest reserves and parks, is in charge of the Dominion inspector of fire ranging, assisted by district inspectors.

The railway companies as a whole are co-operating in good spirit, with the result that fire losses from this source have materially decreased during the past two seasons.

Some few lines, however, in these three provinces, are not under the jurisdiction of the Board, and on that account the enactment of provincial legislation along similar lines is highly desirable, such as has been done in British Columbia and Quebec.

Railway Belt of British Columbia The Dominion lands (outside the reserves) in the railway belt are organized, for fire protection purposes, into the Revelstoke, Salmon Arm, and Coast districts. These are in charge of three chief fire rangers, one responsible to the Crown timber agent at New Westminister, the others to the district inspector of forest reserves at Kamloops. Working under the chiefs are some 50 fire rangers, engaged for the summer months, at \$5 per day. The work consists in the enforcement of the provisions of the British Columbia Forest Act relating to fire prevention. Since these provisions are most modern, the fire ranging service is carried on under very favourable conditions. In addition, the province had a staff of ten rangers on duty in the railway belt.

The inspection in connection with the order of the Railway Board, already mentioned, is, in the railway belt, outside of Dominion parks, in charge of the district inspector of forest reserves, assisted by divisional inspectors. For the lines within the Dominion parks the inspection is in charge of the chief superintendent of Dominion parks, assisted by the superintendents of the different parks, as divisional inspectors.

Provisions for Slash Disposal

To protect city property from fire there is not only provision to extinguish promptly such fires as may be started, but the material conditions obtaining are required to be such as will reduce the chances of a fire assuming uncontrollable proportions. The same two measures are necessary to protect forest property. The presence of a fire-fighting force, and the construction of trails, look-out stations and telephone lines, are merely measures to facilitate the rapid control of fires which start. The supplemental feature lies in the condition of the forest floor as regards inflammability. The smaller the quantity of dry material on the ground, the better is the chance of control; in addition, the fire is not so hot, and less damage is done to the trees and soil.

In all forests there is normally a certain amount of *débris* originating by the natural death of the trees and parts of trees. This is augmented by local windfalls. But the most dangerous component is

the slash resulting from logging operations. A forest when lumbered over is a forest littered with very combustible material; it remains in this condition, year after year, a veritable fire-trap, until the *débris* decays; this is a matter of at least a decade, and frequently two decades or more, except in warm, moist climates. In the past, so universally has fire followed a lumbering operation within a few years that it is generally looked upon as inevitable. In studying the reproduction on logged-over areas this summer (1913), the writer experienced difficulty in finding old cuttings which had not been burned. Since the next tree crop on the lumbered tract is dependent on the seedlings already started, and the trees left uncut, the outlook for this crop is a very uncertain one under present conditions.

There are various methods in use for disposing of lumbering slash, varying in cost and effectiveness. The one aim is, at the least expense, to get rid of the brush as often as needful, not allowing it to accumulate, and, of course, the sooner it is done after logging the better. No uniform system can be followed. The method used must take into consideration particularly the injury to the remaining trees, and whether the conditions following the manner of disposal are favourable to the seedling crop desired. Methods involving more complete disposal should be adopted in the more dangerous situations, and these are the more costly. In each case, the method decided on should be the one which will eliminate the fire danger, or at least shorten its duration, with the smallest expense, and, at the same time not be detrimental to the next crop, since it is largely in the interests of this that the operation is being conducted.

The best results have been obtained by either burning the slash or lopping the tops. The burning may be done in piles or broadcast. When piled it may be burned as the logging proceeds, if in the winter; in the case of summer operations, the burning must be postponed till weather conditions allow. Burning broadcast is cheaper where the slash is heavy, but is harder to control, and is applicable only in clear cutting operations and where the growth conditions left behind are favourable to the tree species wanted.

Lopping the tops has in view the bringing of the material in contact with the soil to hasten decay, and thus shorten the danger period. In this respect, scattering the branches afterwards is an advantage. The pieces must be cut smaller than if burning is practised, and the whole operation is of little use unless done carefully, to get the material actually on the ground. The lopping method is cheaper, of course, than piling and burning, and in a given case the choice resolves itself into a question whether the fire risk is worth the increased outlay. Under certain conditions lopping and scattering is even the better

method, owing to the shelter given to the young seedlings. As far as Dominion forests are concerned, with the exception of certain portions of the railway belt, lopping would be of very doubtful value, since decay takes place very slowly, owing to the dry climate. A financial compromise is often made by broadcast burning of fire lines around the sides most likely to be reached by fire, and lopping in the interior.

The cost of brush disposal varies widely with difference in forest type and locality, as does every other part of a lumbering operation. It can be seen that the outlay depends upon the species lumbered, the method of disposal, the climatic and topographic conditions, the style of lumbering, the quality of labour, and the skill and experience in the work. It is therefore impossible to give average figures of cost, but the following actual figures (mostly secured through the courtesy of the United States forest service) will give some indication of the expense to be expected. They include the range, as also the highest cost data to hand.

ACTUAL COSTS OF BRUSH DISPOSAL*

Locality	Forest type	Operation	Cost per M feet. Cents	Remarks
Bitterroot Forest, Montana	Western yellow pine	Piling	42	37 million feet
Bitterroot Forest, Montana	Western yellow pine	Burning later	7	
Blackfeet Forest, Montana	Larch-Douglas fir	Piling	40	\$2 million feet off 3,300 acres
Cœur d'Alene Forest, Idaho	Western white pine	Piling	42	
Minnesota	White and red pine	Piling	40	Windrows
Idaho, Utah and Nevada district	Lodgepole pine, Douglas fir, yellow pine, Engelmann spruce	Piling	25	Contract price
Idaho, Utah and Nevada district	do. do.	Burning	6	
Idaho, Utah and Nevada district	do. do.	Lopping and scattering	5-10	Range in different cases
Idaho and Montana	Lodgepole pine	Piling	15-25	
Idaho and Montana	Yellow pine and Douglas fir-larch types	Burning later	20-50	
Idaho and Montana	Western white pine	Burning later	8	7 million feet
Idaho and Montana	Western white pine	Piling	50-60	
Crowsnest, B.C	Engelmann spruce-lodgepole pine (25 per cent.)	Burning broadcast	2-7	
		Burning broadcast	25-50	
		Burning broadcast	2-6	
		Piling	40-60	
		Burning later	3-6	
		Burning broadcast	10	
		Burning broadcast	25	Experiment with 300 acres; stand 15 to 20 M per acre

*The slash disposal problem has not yet (1913) been taken up systematically in connection with Dominion forests.

ADMINISTRATION OF DOMINION FORESTS

In 1869 Ruperts Land and the Northwest Territories became the property of the Dominion of Canada, on arrangements being made for the extinguishment of the rights of the Hudson's Bay Company. In the same year an act was passed making provision for the temporary government of this area, and in the following session the province of Manitoba was formed, with its own constitutional government, and withdrawn from the operation of the foregoing act. Later, the provinces of Saskatchewan and Alberta were organized, each with its local legislature.

The control and management of this vast territory in the northwest was confided, March 1, 1871, to the Secretary of State for Canada, a Dominion Lands Branch, in charge of a Surveyor General, being established for that work. On the erection of a Department of the Interior in 1873, the Dominion Lands Branch passed to that department, which has from that date administered these western lands. During the 40 years since, several secondary branches have been created to cope with the increasing volume of the business of administration. This, of course, relates only to unalienated lands.

Timber Branch To understand the present methods of administration, in so far as it relates to Dominion forests, it will be convenient to briefly sketch its development. The western lumber industry began early to develop, and in 1880, a Timber, Mines and Grazing Branch was formed at the head office, to have charge of this field of administration. The business on the ground was in charge of a Crown timber agent, the work having to do with the collection of ground rent and dues, scaling of timber, inspection of sawmills as to capacity, control of trespass, etc. New timber agencies were established in quick succession, and by 1884 there were Crown timber agents at Winnipeg, Edmonton, Calgary and Prince Albert. Working under the direction of these agents were some seven forest rangers, whose duties consisted in seizing illegally cut timber, reporting on sawmills, and carrying out other departmental business in the field. During 1884 and 1885 an exploration of the resources of the railway belt was made, and in the following year a Crown timber office was opened in New Westminster.

At present there are six timber agencies, with offices at Winnipeg, Prince Albert, Edmonton, Calgary, Kamloops and New Westminster, in most of these the one official acting in the dual capacity of land agent and timber agent. In the smaller places the land agent performs minor timber agent duties in his district. The field inspection as to the carrying out of the timber regulations is done by Crown timber

inspectors, one or more being attached to each agency. Here again, this work is in some cases combined with the duties of land inspection. Over all there is an inspector of agencies, who supervises the administration of each office.

Forestry Branch From a comparatively early date the officials of the Department of the Interior were aware of the importance to the west of an adequate timber supply. As has been the case in other countries, tree planting engaged the minds of men before the question of protection from fire. Thus, as early as 1875, we find the Surveyor General urging "the expediency of encouraging tree planting in Manitoba and the Northwest Territories." Indeed, in 1884, a special commission was appointed "to examine into and make a report upon the subject of the protection of the forests of the Dominion and the planting of trees on an extensive scale." Annual reports were made for several years, but no action resulted. Fires were severe and widespread, and already in many localities fuel and building logs could not be procured. Finally, the fear of a timber famine in the west led the department in 1893 to embark on a policy of setting aside certain non-agricultural Crown lands adjacent to settlement as sources of future timber supply, and for the equalization of water flow as well. Before this, in 1885 and 1886, certain mountain park lands had been reserved to the Crown under the provisions of the Dominion Lands Act, the impetus having been given by the discovery of hot mineral springs near Banff, Alberta. The formal constitution as reserves, however, took place later. The parks, of course, were set aside on account of their scenic qualities. The timber reservation policy began with the creation of Moose Mountain reserve, by departmental order, in 1894, followed the next year by Riding Mountain, Turtle Mountain, and Spruce Woods reserves.

So far, in the administration of the Dominion forest land, attention had been given almost wholly to facilitating the cutting of timber and perfecting the system of revenue collection. There were some local fire guardians, appointed under territorial ordinance, to look after prairie fires, but disastrous fires swept the country every dry season. The reserved areas were virtually without any system of protection, beyond the cutting of a few fire guards through timber on two of the reserves. The seriousness of the fire damage was realized, however, by some of the officials. Thus, the chief clerk of the Timber Branch, in his report for 1887, speaks of "the necessity of providing some better means than at present exist to prevent the destruction annually by fires of millions of feet of timber throughout Manitoba and the Northwest Territories." Periodically, for years, we find the field officials, in their reports, pointing out the necessity of greater fire protection,

the need of rangers on the timber reservations, of more control of trespass, of conserving timber along streams from the Rockies, and of prairie planting.

At last, on August 15, 1899, a "chief inspector of timber and forestry" was appointed, and this marks the beginning of a branch to organize a system of fire protection. The plan adopted was that of a local selection of fire rangers, working under the direction of the Crown timber agent for the district, or his sub-officers. The agent prescribed the patrol area, and notified the ranger when to commence and when to quit, according to the nature of the season. Each year saw this organization extended into new regions, so that the force with 22 rangers in 1903, numbered in 1912 some 165 men (outside of reserves). The work of supervision has grown beyond the capacity of the Crown agents, with their other affairs, and chief rangers, with no other duties, and with an inspector over all, are in charge.

The forest reserves likewise began to receive some attention as the result of this new step. A system of fire-guard construction along boundaries adjoining open prairie was begun, and forest rangers brought about a more desirable state of affairs as regards fire and timber theft within the reserves. The work of examining non-agricultural areas and creating new reservations went steadily ahead. The Forestry Branch is still the only agency for the classification of Dominion lands.

The long-discussed matter of prairie planting was settled in 1901 by the creation of a planting division, and the establishment of a nursery at Indian Head, Saskatchewan. The object has been to supply settlers with trees for planting as shelter belts and small wood-lots. Up to 1913, some 25,000,000 trees have been supplied to applicants, with highly successful results. Stock has also been grown for experimental planting on some of the reserves. It must be borne in mind that the project is not intended to have any relation to the problem of general timber supply.

An important stage was reached in 1906, by the passing of the Dominion Forest Reserves Act, which placed the control and management of the reserves under the Forestry Branch, with provision for the making of regulations for their handling. At the same time a large number of new reserves were created. The licensed berths within reserve boundaries, however, were exempted from reserve regulations, an anomalous action, which removed practically all the mature timber and all the logging operations from the application of forestry practice.

In the present organization, for administration of the reserves in the field, the whole area is divided into four inspection districts, corresponding with provincial boundaries. These are in charge of district

inspectors, with offices at Winnipeg, Prince Albert, Calgary and Kamloops. The inspectors, with one exception, have had a technical training in forestry, and are responsible to the head office at Ottawa for the initiation and supervision of all the work in their respective districts. In short, the inspector is the business manager of the reserves in his care. Each district is subdivided into administrative units, each in charge of a forest supervisor. These units correspond with individual reserves, where size permits; large reserves, such as the Rocky Mountains reserve, are, however, divided up, and small ones are grouped together under one supervisor. As far as possible, supervisors are chosen who are technically trained men. Assisting the supervisor are one or more forest assistants, graduates of forestry schools. Each reserve is in turn laid off into ranger districts, to which are assigned the necessary number of forest rangers. At the close of the season in 1913 the permanent field force comprised some 4 inspectors, 10 supervisors, 6 forest assistants and 50 rangers.

**Parks
Branch**

The Forest Reserves and Parks Act of 1911 made provision for the designation of suitable reserved areas as Dominion parks. Notable among these are Rocky Mountains, Jasper, Buffalo and Waterton Lakes parks in Alberta, and Yoho and Glacier parks in British Columbia. These are administered by a Parks Branch at Ottawa, in charge of a commissioner of Dominion parks. The outside service consists of a chief superintendent, located at Edmonton, and a separate organization of rangers in each park under a superintendent. The work consists of protection of the forests and game, and the carrying out of improvements in keeping with the purposes for which the parks were created.

DISPOSAL OF DOMINION TIMBER

**Early
License
Regulations**

The forest resources of the Dominion lands early attracted the attention of lumbermen. For instance, a sale of timber berths on lake Winnipegosis was held on November 1, 1879, at which fifteen limits, totaling 605½ square miles, were disposed of for a total bonus of \$22,665. The sales were subject to the cost of survey, a ground rent of two dollars per square mile per annum, and five per cent royalty on the sales of products of the berths. Slightly later sales carried a rental of five dollars per mile, and the trees under 10 inches were reserved. These earlier disposals of timber berths took the form of leases, made under various conditions. However, the Dominion Lands Act of 1879 provided for the yearly license system, and the regulations of March 8, 1883, would appear to be the first governing the granting of licenses to cut timber on Dominion lands.

The essential features of these regulations were: The limitation of the area of the berth to 50 square miles; a yearly ground rent of five dollars per square mile, and a royalty of five per cent on the sale of all products; the requiring of the construction of a mill of 10,000 feet daily capacity, to run at least six months in the year; provision for renewal of license for another year if the area was not needed for settlement; and provision for inviting bonus tenders in the case of conflicting applications. Thus the public auction system was early foreshadowed, and two years later the Department discontinued granting timber berths except by public competition.

The above regulations governed the disposal of timber on Dominion lands, not only in Manitoba and the Northwest Territories, but also in the railway belt of British Columbia, as far west as the 120th meridian (about 25 miles east of Kamloops). This point was chosen as being the district west of which all timber cut was likely to find its way to the Pacific for export, rather than eastward. West of the 120th meridian, the regulations were framed to harmonize very largely with the British Columbia provincial timber laws, which were drawn up with a view to meeting the exigencies of the export trade to South America. There were two sets of these.*

On Dominion lands west of 120° and north of latitude $49^{\circ} 34'$ (Yale), the license carried no restrictions as regards area or time limit; \$50 yearly rental; royalty 30 cents per tree felled and 75 cents per thousand board feet (neglecting small timber for skids, rafting timber, etc.); no logs to be sawn until scaled by Crown timber agent by Scribner log rule and dues paid; and trespass was punishable by a fine of \$3 per tree.

For lands west of 121° and south of $49^{\circ} 34'$ (Yale to Vancouver) the regulations differed in that the area was limited to 1,000 acres;† rental \$10; royalty 15 cents per tree and 20 cents per thousand board feet; and trespass dues \$1 per tree. The license form, in the case of both regions, "reserved for Her Majesty for all time any and all exceptionally large trees on the tract," and stated specifically that the regulations "shall not apply to the cutting of trees known as hemlock."

Thus, at this period there were three sets of regulations governing the granting of yearly licenses; one set applying to Manitoba, the Northwest Territories, and the railway belt as far west almost as Kamloops, another to the railway belt from this point to Yale, and a third set from Yale to the coast.

*See regulations dated April 20 and July 16, 1885.

†Owing to the owners increasing the capacity of their mills this was amended on November 2, 1886, to increase the area up to 2,000 acres for each 25,000 feet B M. of daily mill capacity, and a time limit of four years set.

On September 17, 1887, the boundary of the application of the regulations obtaining in the Northwest Territories was shifted eastward from the 120 meridian to Eagle pass at the summit of the Gold range, a few miles west of Revelstoke.

This multiplicity of regulations was simplified on September 17, 1889, by an order in council, by which the regulations governing the disposal of timber in Manitoba and the Northwest Territories were made to apply to the entire railway belt, except that west of Eagle pass the yearly rental was to be \$32 instead of \$5 per square mile (the rent charged in Manitoba and the Northwest Territories), and further, that a rebate of one-half the royalty, amounting to about 25 cents per thousand feet, would be allowed upon lumber exported to foreign countries. These two exceptions were in conformity with the provincial regulations. The rebate provision was cancelled in the following year, on the ground that towage to Vancouver on timber cut from Dominion lands was much lower than on timber from provincial lands. At the same time, licensees were given the option of paying the five per cent royalty either on the value of the lumber in the log, or at the period at which the manufactured lumber was sold. This amendment was found necessary owing to the impossibility of those holding licenses for both Dominion and provincial lands to separate the lumber manufactured from timber cut on the different berths.

Throughout these years the policy had been to promote the establishment of sawmills for the convenience of settlers remote from railways and lumber centres. To this end the licenses had carried a provision for the erection of a mill within a specified period. On January 20, 1892, this was changed so that the lumberman was no longer required to construct .. until notified by the department to do so, on the ground that facilities for settlers to purchase lumber were, for the present, ample in almost all settlements. This, of course, was conducive to the taking up of berths for speculative purposes, and the regulation is still in force.

Present License Regulations Finally, on July 1, 1898, the regulations were once more overhauled, and these, with some later amendments,* constitute those at present in force. These, on their fiscal side, are virtually the same as those of 1883. The yearly

*January 23, 1900. The rental of berths between Eagle pass and Yale was reduced from \$32 per square mile to \$5 per square mile per annum.

April 9, 1901. One-half cost of guarding the timber berth from fire to be defrayed by licensee.

July 30, 1901. All timber cut under license in railway belt to be manufactured in the Dominion.

September 24, 1901. Rebate of 40c per thousand on export lumber cancelled.

March 31, 1908. Upset price fixed before sale of berth and berth cannot be sold below this.

ground rent is still five dollars per square mile (640 acres), except for lands situated to the west of Yale, in which case the rent is \$32. The dues are practically the same as then, being 50 cents per thousand feet of sawn timber, $1\frac{1}{2}$ and $1\frac{3}{4}$ cents for railway ties eight and nine feet long respectively, 25 cents per cord of shingle bolts, and five per cent on the sale of all other products. On burnt timber the dues are reduced one-half.

Other important features are:

1. The disposal of licenses by public auction, with an upset price.
2. A diameter limit of 10 inches at the stump.
3. Provision for the leaving of seed trees to provide for reproduction.
4. Provision for the elimination of waste.
5. Provision for the disposal of logging *débris*.
6. Provision for dealing with trespass.
7. A clause to the effect that one-half the cost incurred by the Crown for guarding the timber berth from fire shall be defrayed by the licensee.
8. Explicit understanding that the license is a yearly one, renewable "subject to the payment of such rental and dues, and to such terms and conditions as are fixed by the regulations in force at the time renewal is made."

**Efficiency of
License
Regulations**

Fiscal Regulations.—It may be pointed out that the ground rent and lumber dues on Dominion licensed berths have remained practically stationary for thirty years, despite the rise in lumber values, which has led the provincial governments to materially increase their rates in the case of provincially owned timber. Yet, excepting Manitoba, the average mill sale price of spruce (the species most widely cut on Dominion lands) is on the whole lower in these eastern provinces.*

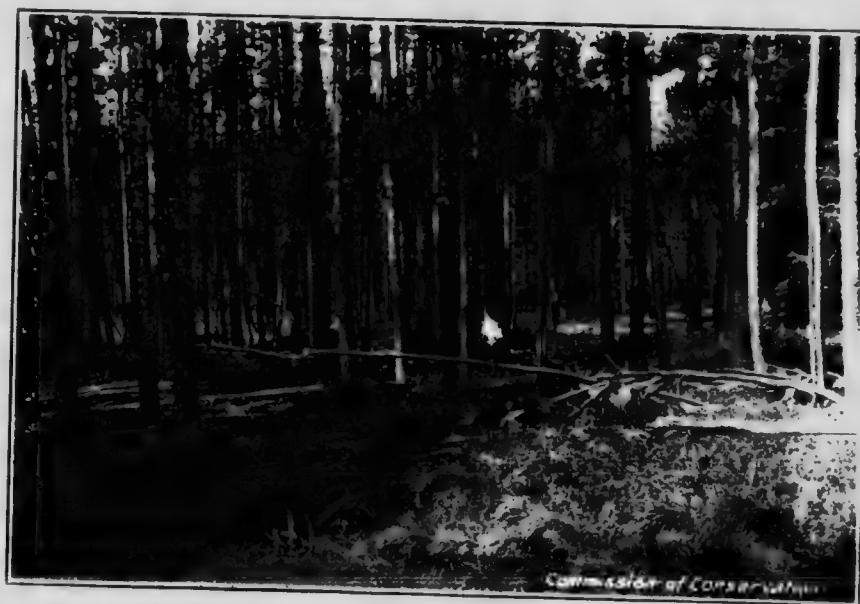
Besides the yearly ground rent, the licensee pays dues of 50 cents per thousand feet board measure, when the timber is sawn. On referring to the rate on spruce in other parts of Canada, we note that in Ontario the dues are \$1, in New Brunswick \$1, and in Quebec \$1.05; in British Columbia it is 50 cents, but this is influenced by the high ground rent charged.

The licensee also pays one-half the cost of fire-guarding the timber berth, the government paying the other half. From the last annual report of the department we find that the total revenue from this source was \$22,856.17. Since there were some 8,065 square miles under license, this averages a charge of about \$2.85 per square mile to

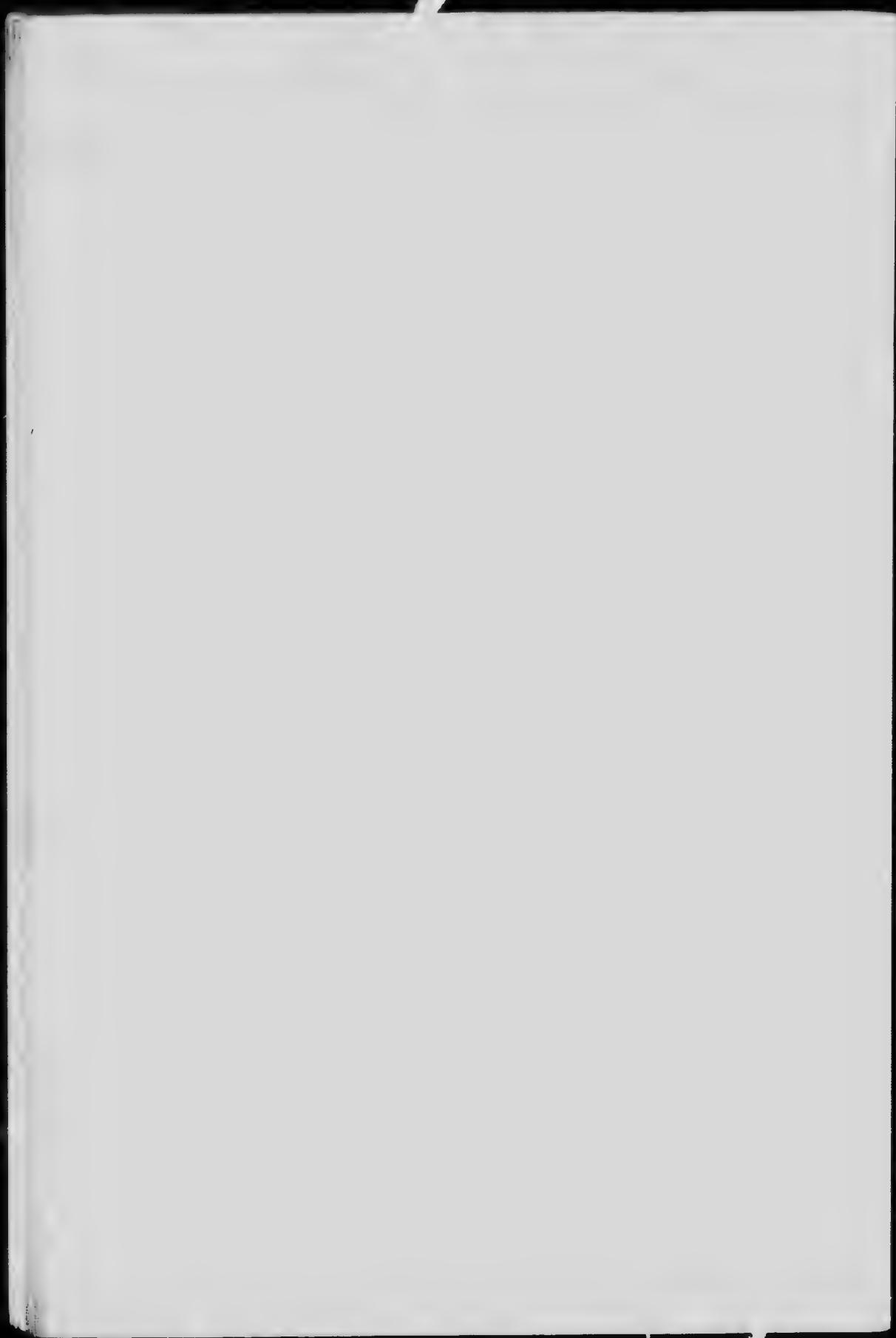
*See table 12 in *Bulletin 40*, Forestry Branch.



MATURE STAND OF LODGEPOLE PINE AND ENGELMANN SPRUCE
This type characterizes the Rocky Mountain Reserve of 13,000,000 acres.



INTERIOR OF THE SAME
At maturity the lodgepole pine averages about 12 inches in diameter.



be met by the lumberman. In British Columbia the fire tax is \$9.60 per mile, and in Ontario and Quebec the licensee bears the whole cost.

The annual ground rent is five dollars per square mile—less than one cent an acre—except for lands situated to the west of Yale in British Columbia, in which case it is \$32. In contrast with these rates provincial timber land in British Columbia carries a yearly rental of \$115 east of, and \$140 west of the Coast range. On the other side, ground rent in Ontario and Quebec is five dollars, and in New Brunswick eight dollars per mile. It must be clearly understood that ground rent has, theoretically, no relation to the timber,—it is a charge for land rights.

The result of the low rentals charged by the Federal government, coupled with the fact that operation is unnecessary until notification by the Department, has been the entrance into the lumber business, more or less, of speculation in berths. This is evident by a comparison, through the years, of the area under license with the total lumber cut. For some years the practice was followed of increasing the rental, usually doubling it, in the case of berths held five years without operation. No serious dropping of licenses appears to have occurred, but the policy was given up. While the non-operation of timber berths is satisfactory from the standpoint of conservation of forest wealth, yet the nation is entitled to its share of the increasing value of the country's timber resource. Especially is this the case when it is taken into consideration that the great bulk of the accessible merchantable timber on Dominion lands is already under license. On the other hand, a too high rental forces operation, regardless of market conditions, in this era of overproduction of lumber.

A just mean may be found, in a sliding scale of timber royalties, which does not injure the interests of either party, giving the public its share and rewarding foresight in the lumber industry. This principle of participation in increment has been virtually recognized of late years, and the timbered provinces have periodically revised their license charges, these to remain fixed for a certain period of years to ensure stability to investment.

Cutting Regulations.—Of much more importance than the question of equitable rental and dues is that of the control of logging operations, for on the condition of the forest after lumbering depends the amount and quality of the future forest. Dependence for the next crop is to be placed upon natural regeneration, since planting is at present considered to involve too high an immediate outlay. Provision must, therefore, be made, through the regulation of logging, for the natural reseeding of the area by the desired tree species.

In reference to this question of reproducing the forest, the most apparent point is the incongruity of uniform cutting regulations to apply to vastly different forest types and market conditions. The same regulations govern the lumbering of the white spruce-aspen type of northern Manitoba and Saskatchewan, the lodgepole pine-Engelmann spruce type of western Alberta, and the wet, dry and coast regional types of the railway belt. Logging in these different types necessarily results in a wide variation of conditions for seed germination and seedling growth, and as each tree species has its own inherent biological requirements, it is evident that uniform logging treatment cannot result beneficially.

The idea of the imposition of a diameter limit, below which trees are not to be felled, is to leave seed trees to prevent the extinction of the merchantable species. The lumberman naturally has no interest in the future forest on land that does not belong to him, and his tendency in logging is to cut all that is marketable with profit. This is ordinary business. The initial improvements, in the shape of buildings and roads necessary to log a certain tract, form a fixed overhead charge, and the more timber taken off the area, the lower is the expense per thousand feet, as far as this item is concerned.

The diameter limit on Dominion berths is 10 inches. In operations a decade ago the market offered no inducement to cut below the limit. But, year by year, with disappearing supplies, the lumbering standards are becoming less fastidious, and in the smaller timber there is a temptation to cut below the legal limit, and conduct what amounts to a clean-cutting operation. Moreover, a stump diameter limit means nothing, since stumps vary in height. The size of tree taken with a

inch stump is a matter of how far down in the root swelling, present on all trees, the cut is made. The limit should at least be stated in terms of the diameter at a certain height.

An arbitrary diameter limit very seldom brings about the perpetuation of the desired forest. Unless the stand contains a wide range of sizes, too few trees are left to seed up the area, and, in the case of spruce, the isolated trees are very apt to be wind-thrown. In addition, the trees remaining are not spaced to the best advantage to distribute the seed. Even if the above requirements are accidentally met, as sometimes happens, the openings made by cutting to a rigid limit may or may not be favourable to the growth of the seedlings desired.

As a general statement, the above factors characterize the conditions to be observed on logging operations on Dominion lands. The present lumbering methods result usually in leaving an insufficient number of seed trees, and in consequence the forest is yearly deteriorating. In this connection it is of interest to note that in the leading

centres of spruce production the limit is much higher. In Quebec it is "12 inches measured two feet above the ground," and in New Brunswick "no spruce tree shall be cut which will not make a log at least 16 feet in length and nine inches at the small end."

The remedy for the defects of an arbitrary diameter limit consists in designating the trees to be felled, even if a diameter limit be kept as the general basis of selection. This permits control of cutting so as to provide proper seed trees. Marking in this manner adds to the cost a maximum of five cents per thousand feet marked.

Besides the restriction as regards size of trees that may be cut, the licenses contain a clause "that the licensee shall not have the right to cut any trees that may be designated as required to provide a supply of seed for the reproduction of the forest." This is an extremely important condition to be inserted in a license, as it provides for full control of the operation through the marking system. Obviously the trees must be designated before the sale, otherwise the purchaser is unable to estimate his logging cost and so decide on the bonus he can afford to bid. So far as is known advantage has not been taken of this seed tree provision.

Likewise, there is engagement on the part of the licensee to dispose of the lumbering débris as directed by the department, but it cannot be said that as yet any systematic effort has been made to cope with the slash evil.*

Another clause deals with undue waste. At present, wasteful methods are to be seen only in the case of some small operators and some contract logging. All the large operators realize the loss to themselves and usually have special men attached to the camps to keep waste down to a minimum. Jobbers are usually paid by the thousand feet and are therefore interested in getting out only the large logs of a tree.

Trespass is usually punished by double dues. Where the timber has been removed beyond seizure a maximum fine of three dollars per tree is provided for. The activity of the timber inspectors in this connection is seen in the seizures and fines for 1912, amounting to \$31,245. Owing to the numerous sides to some berths the difficulty of controlling trespass is accentuated.

On the whole, the present regulations would provide fairly well for the next crop, if provision were made for taking advantage of them. But this is impossible with the few men engaged in inspection work.

*The Forestry Branch has since made a beginning at brush disposal on permit areas in forest reserves. This, however, does not affect licensed timber berths or lands outside forest reserves.

**Permits
(Outside
Reserves)**

Early Regulations.—From the beginning, in the administration of interior Canada, the policy was followed of allowing the homesteader to cut from Dominion lands, free of charge, such building and fencing material as he required for his own use; and in addition, provision was made for the cutting of sawlogs, building logs, cordwood, ties, fence posts and poles, locally, from Dominion lands, on the payment of certain dues. These privileges are known as permits, as distinct from licenses.

In the early 'seventies various regulations were already in force governing permits to cut timber in the different districts.* On account of the lack of uniformity a consolidation of these took place by order in council dated October 10, 1881.

By these new regulations homesteaders were allowed for their own use, free of dues, 1,800 feet of building logs, 400 roof poles, 2,000 fence rails, and 30 cords of dry wood. In addition, provision was made for the issuance of permits, under payment of dues, as follows: Square timber and sawlogs of oak, elm, ash and maple, \$3.00 per thousand board feet, of poplar \$2.00, and of all other species \$2.50; cordwood, 25 cents per cord; fence posts, 8 feet 6 inches long, 1 cent each; poles, 22 feet long, 5 cents each; ties, 8 feet long, 3 cents each; rails, 12 feet long, and stakes, 8 feet long, \$2.00 per thousand pieces; shingles, 60 cents per thousand; and all other products 10 per cent ad valorem. All permits carried an office fee of 50 cents.

These regulations were superseded five years later by another set, which aimed at securing utilization for farm use of the smaller sized timber, and as much of it poplar as possible, instead of spruce and pine. The maximum size of fence rails and posts was stipulated, and the dues on all rails other than poplar were raised to \$5 per thousand. New provisions allowed for the sale of building logs of poplar at one-half cent per lineal foot, and logs of other species at one to one and one-half cents. Dues on dry or fallen cordwood were reduced from 25 cents to 10 cents per cord, for own use, and on shingles from 60 cents to 40 cents. A notable feature of these regulations was a new clause to the effect that "the permittee shall cut up the whole of the tree felled, in such a way that there shall be no waste, and, to prevent the spread of prairie or bush fires, the refuse shall be piled together in a heap and not left scattered through the bush."

Since 1886 there have been various amendments of the regulations, but mostly minor ones relating to quantity of timber and rate of dues.

Present Regulations.—Under the present regulations there is pro-

*See those referring to Manitoba, dated January 13, 1873, and January 17, 1876; to Keewatin, dated June 25, 1875; to Northwest Territories, dated March 20, 1878.

vision for various classes of permits. A homesteader is allowed one free permit covering allowance of timber for building, fencing and fuel purposes, to the extent of 3,000 lineal feet of logs (roughly 9,000 feet of sawn lumber), 400 roof poles, 500 fence posts, and 2,000 fence rails. In case of loss of buildings by fire he is allowed a second permit. Also if he have no timber supply of his own he is allowed to cut dry, i.e., dead, timber for his own use for fuel and fencing, free of dues. All other permits to cut timber on Dominion lands are subject to payment of dues.

Owners of mills may be granted permits covering up to 640 acres, at \$100 per mile, and subject to the same dues as licensees of timber berths. Permits are also given to cut timber as cordwood, fence posts, telegraph poles, ties and mining timbers, covering areas up to 160 acres, upon payment of \$25 and specified dues. These dues are: Cordwood, 25 cents; fence rails and roof poles, 2 cents; fence posts, 1 cent; building logs, $\frac{1}{2}$ cent to $1\frac{1}{2}$ cents per lineal foot; according to species, telegraph poles 5 cents up, ties 3 cents, and sawlogs \$1.50 per thousand feet board measure. These mile and quarter-mile permits are intended to cover special circumstances, where timber is specially and locally required, is fire-killed, or exists in isolated blocks. The rental charge is on the basis of being granted without competition (owing to the expense attached), in this differing from a license.

Settlers may also be granted permits to cut the above products for their own use, at the same prices. Operators of coal lands may cut their mining timbers on payment of one-eighth to one-half cent per lineal foot, according to diameter. Provision is also made for permits covering cordwood for sale, up to 100 cords, at 25 cents, or $12\frac{1}{2}$ cents if dry; shingle bolts in the railway belt, up to 100 cords, at 50 cents; fire-killed timber in the railway belt; and timber needed for construction of public works. In the Peace River district portable sawmill owners may be granted permits covering up to one square mile and up to 200,000 board feet, subject to dues at 75 cents per thousand feet.

All permits carry an office fee of 25 cents, and are issued at the Crown timber offices. Each permittee is subject to cutting regulations after the same manner as the licensee of a timber berth. There are clauses forbidding waste, and requiring the piling of all *débris*. Likewise, one-half the cost of fire-guarding the timber must be paid by the permit holder of the berth.

The permit system is very widely made use of in the middle west. In 1911-12 some 12,000 permits were issued, the bulk of which were probably free of dues. The majority were issued by Edmonton, Dauphin, Moose Jaw, Winnipeg and Prince Albert offices, the railway belt doing a comparatively small permit business. An idea of the large

amount of timber involved may be gained from the tables already given on pages 6-7.

A distinction must be noted between the larger operations and those of the settler. The former, on the mile and quarter-mile berths, are concerned with the manufacture of lumber, cordwood, ties and other wood products, for the trade, and are in reality small licenses. The policy behind is the utilization of timber locally. In the case of the settler the permit system has in mind assistance on the prairie, where wood is scarce, a substitution for the woodlot conditions usual on eastern farms.

Wherever possible portable mills should accompany all tie and piling operations, to saw up the tops, which are usually left in the woods. In one case which came under observation, involving 5,000 ties, the lumber so manufactured from the tops amounted to nearly 30 per cent of the total, counting 30 board feet to a tie. This would mean a considerable saving in wood product, and also increase the revenue to the Crown from the operation. The fixed rate of permit dues at \$1.50 per thousand feet of lumber, however, is too high to allow manufacture of tree tops, while the ordinary sawlog industry pays 50 cents.

From the standpoint of administration, the troublesome feature about the permit system is the difficulty of control of the cutting, owing to the large number of small operations. The supervision is divided, those on forest reserves being under the Forestry Branch, and those outside the reserves under the Timber Branch. The main considerations requiring attention in connection with cutting under permit are wasteful cutting, piling of slash, and theft. The Forestry Branch, with a large field force of rangers, has a better chance of control of these in its territory than has the Timber Branch, with its small staff of inspectors, and as a matter of fact the latter's attempts to do so are confined to the large operations, and the majority of permit cuttings are without supervision. In the case of the reserves, the system of allowing portable millmen to locate inside, and log sufficient to cover the lumber permits of the settlers of the district, makes control easier by the centralization of the operations. Various abuses of the principle of the permit system, of course, are in existence.

**Disposal
Within
Reserves**

It must be clearly understood that not all the reserved forest land is subject to the regulations relating to forest reserves. Within the reserves there are park areas, which are administered by a separate branch, since the management of forest land for park purposes is naturally different than if for timber. Also, as already noted, there are licensed berths, which include the bulk of the accessible mature timber. These latter operations are subject to the regulations which have been given in the section dealing

with licenses (see p. 33); the enforcement of these regulations is in the hands of the Timber Branch. The Forestry Branch, which has control of the forest reserves, has no administrative connection with the licensed land within reserve boundaries, beyond protecting it from fire. The forest reserve regulations, framed along modern forestry lines, are applicable only to the unlicensed portions of each reserve. It is with these only that we are here dealing.

Free Permits.—These cover 25 cords of dry wood, to any applicant, for his own use; also, to homesteaders, free building material, as in the case of Dominion lands in general use (see p. 39), except that the application for such a permit must be made within five years of the date of homestead entry. This reduces the chance of fraud.

Paid Permits.—These are issued to a variety of users, as follows: To settlers resident within 50 miles of a reserve, for their own improvement uses; to miners and prospectors for development work; for municipal or public works, and for rural schools and churches; for the use of occupants, permittees and lessees of lands within the reserves; for non-commercial irrigation works; for right-of-way construction, and for railway construction. The principle underlying this policy is that the reserves exist for the use of the public in building up the country. The reserve regulations state the maximum quantities obtainable under permit for each particular class of user; and the minimum rate of dues for each form of wood product practically corresponds with that charged in the case of Dominion lands outside of reserves (see p. 39). All permit operations on reserves are under the control of the forest officers, and among other conditions stumps are limited to 18 inches in height and all *débris* must be piled for burning. The system of issuance of the permits by another office, however, does not facilitate supervision.

Sales.—The reserve regulations provide for sales of timber by tender up to 5,000,000 feet, under contract approved of by the director of forestry. The removal is limited to five years, thus preventing speculation. The other conditions of the agreement are fixed to suit each case after thorough examination of the tract. These will include specific designation of what trees may be cut, the price to be paid per unit of product, as determined by the ease of logging and market, the scale to be used, the method of brush disposal, and the penalty for cutting unmarked trees. This method of selling timber is a distinct advance on the old license system, with its uniform regulations for all conditions, since its elasticity permits of provisions being inserted in the contract in the interests of the next crop. By this method each sale is a separate contract, the conditions of which may be made to suit the case in hand; in addition, the Government gets full value for

its timber, at the same time preventing depreciation of the property, while the lumberman knows exactly what he is buying and tenders accordingly. It may be added that the timber sale policy, as it is known, has been but recently adopted in reserve management.

There is also provision for the sale, without competition, of small quantities of building material to residents of towns and villages for private use, and of cordwood at 25 cents a cord, up to 400 cords.

**Disposal
Within
Parks**

A few old licenses to cut timber within the Dominion parks are in existence, but little logging is going on, and of late the policy has been to do away with lumbering within the boundaries.

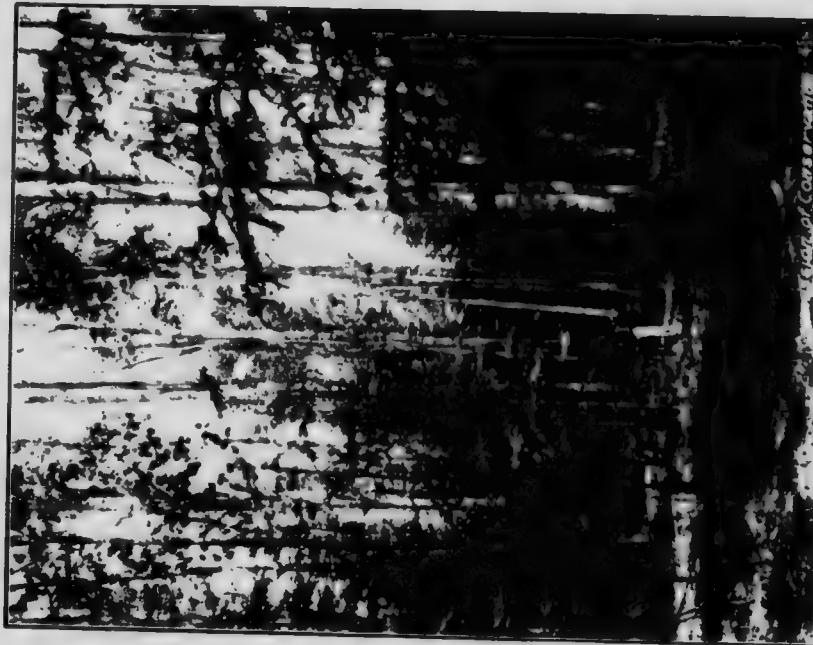
At present, permits are granted allowing removal of dead or fallen timber only. Three classes of permits are issued. Residents are allowed, free of dues, for their own use, 15 cords of wood, from an area limited to three acres, to be cut within three months. Also, yearly permits are granted without competition, covering one-quarter square mile, on payment of \$6.25, plus dues of 12½ cents a cord on all cordwood over 50 cords; if timber other than cordwood is cut all dues above \$6.25 are charged at the rates in the third class of permit. This latter is a yearly permit, granted by public competition, covering up to two square miles, with a rental of \$30 per mile, and renewable for five years. The dues are, for mining props, posts and rails, from one-sixteenth to one-quarter cent per lineal foot, and for cordwood twelve and one-half cents per cord; if such dues equal or exceed the rental the excess is applied on account of the dues.

All permit operations are under the control of the superintendent of the park concerned. Precautions must be taken to avoid the destruction of growing timber, and the starting of forest fires. *Débris* must be disposed of as directed.

SUMMARY

From the foregoing pages we may briefly summarize the essential features. The Dominion government owns as yet the major portion of Manitoba, Saskatchewan, Alberta and the railway belt. A large share of the property is forest, and on land which will always be of use for lumber production only. The management of this should accordingly aim at continuity of crop for revenue purposes. With this in view some changes are desirable in the handling of this resource.

The portions of the Dominion forests which have been dealt with embrace mainly the timber berths and the forest reserves. The former include the bulk of the accessible mature timber (partly within, and partly without the reserves), while the reserves are largely covered



U.S. FOREST SERVICE

FOREST SERVICE

It has escaped the fires and is a very promising stand.



U.S. FOREST SERVICE

FOREST SERVICE

If fires are controlled in the northern prairie provinces the forest will gradually revert to spruce.



with immature stands or inferior species, from which no material revenue can be expected for some time. As we have seen, these are administered separately and by two distinct organizations, the one concerned with the business incident to licenses, the other mainly a field force in charge of reserves—an undesirable division of authority.

The protection of all Dominion forest lands is in the hands of the Forestry Branch,* with one force for the reserves and another for the lands outside reserves, the latter enforcing provincial fire regulations. From the standpoint of legislative authority the reserves force is backed by efficient regulations, as is also the other staff so far as the railway belt is concerned. It has been pointed out, though that the rangers protecting timber outside reserves in Manitoba, Saskatchewan and Alberta are working under ancient legislation, designed to control prairie, not forest fires.

The greatest menace to the safety of timber, namely, the slash evil, is, however, beyond the reach of the protective force. In the case of settlers' slash, this is because of inadequate fire laws in the prairie provinces. In the case of lumbering slash, it is owing to the operations on licensed berths being without their jurisdiction.

This matter of slash disposal is one of pressing importance, but only comes to notice periodically with the advent of an unusually dry season, such as 1910. Then, small fires, by reaching old cuttings, attain uncontrollable size. Long as this relationship has been realized, it is only of recent years that steps have been taken to meet the situation. The lead was taken by the United States Government, and now all their timber sale contracts contain an agreement on the part of the purchaser to dispose of the *debris* after the method designated. This is also the case in the province of British Columbia, in all recent sales. Many coast lumbermen in British Columbia, operating under old licenses, burn their slash of their own volition. It is becoming more and more recognized that slash disposal is an integral part of the logging business.

The different methods of disposal, with their advantages and objections, have been already outlined (pp. 254-256). The strongest objection is the cost, and Canadian lumbermen must compete with outside manufacturers. At present the disposal of all lumbering slash on Dominion berths can not be advocated. It is in many cases unnecessary, and in others too expensive. But there is no necessity to continue in our old-time ways and keep the fire risk as high as possible. A start must be made in the locations of greater hazard; these will be among the operations closest to civilization (*i.e.*, transportation), and such have a financial advantage over more remote ones.

*The only exception is the New Westminster timber agency.

Even with the most perfect patrol force fires will start, and this contingency must be provided against by reducing inflammable conditions. At first the work will need to be done by co-operation between the lumbermen and officers of the department. Experiment with different methods to suit different conditions will be necessary. Brush disposal is an art in itself, and success can only be reached through experience. Beforehand "knowledge" of what can *not* be done is the commonest hindrance to progress.

The question of the relationship between lumbering methods and the next revenue-producing crop on Dominion lands has been discussed in the section on licenses (see pp. 35-37). This next crop will be inferior in quality as it is, owing to the preponderance, among the trees left behind, of other seeding tree species which cannot be cut because of lack of market. This unfavourable feature cannot be helped. But the present logging operations in general leave fewer trees of the commercial species than are desirable to provide seed for the succeeding stand. This can be remedied with least interference to the lumbering industry through the application of the clause in licenses providing for "the leaving of such seed trees as may be designated by the department."

The decision as to whether the management of Dominion timber lands, in so far as it relates to cutting methods, is to follow along time-honoured paths, or is to take advantage of the world's progressing knowledge in silviculture, at once confronts the lumberman's brief of vested rights. Undoubtedly there is some foundation for this claim, resulting in large part from the allowing of transfer of licenses, as if they were property and not scrip. A license is the right to cut for one year, under certain conditions, but this has been tacitly ignored, and the power to regulate cutting has thus been correspondingly weakened.

On the other hand, license conditions agreed to each year provide for renewal "subject to the payment of such rental and dues and to such terms and conditions as are fixed by the regulations in force at the time renewal is made." This is a yearly warning, and changes have been made from time to time in the conditions attached to Dominion licenses. The enforcement of cutting regulations in the interest of the next crop would be no hardship, considering Dominion timber charges in comparison with other parts of Canada (see pp. 34-35), and the increased value of stumpage since purchase. Besides, in the case of berths held for increment in value, the operator, through the natural growth, becomes the owner of wood product which was not on the berth at the time of purchase, and which was not represented in the original bonus he paid. Paying ground rent for a long

period of years can give no claim to the increased value of the timber, any more than in the case of the lessee of any other kind of property.

Be the pros and cons what they may, the simple fact remains that a continuance of the present methods of handling our mature timber means its exhaustion, and the consequent passing of an important industry in the west. And this on soil of value for nothing else, and in the face of the experience of such regions as the New England and Great Lakes states. Only a nation of fatalists can go on in the old traditional methods till actual depletion of our forest wealth is at hand. The situation must be faced, and knottier problems have been solved on the basis of compromise. The Government is financially interested from the standpoint of future revenue, while the lumberman must be rewarded for his foresight and enterprise by a portion of the increment. The form in which the Crown takes its share is by regulating logging in the interest of the next crop.

What may be done is necessarily a financial compromise between what is best for the forest and the market conditions of the lumbering industry. At the outset no changes are needed in the license conditions. All that is necessary is to take advantage of them. The modern viewpoint in timberland administration is a working for continuity of crop, and the Dominion timber regulations make ample provision for this, as was shown in the discussion of the license clauses. But the carrying out of cutting regulations requires an adequate trained force in the woods, and not a handful of men with multitudinous office duties as well.

All true forest land, whether reserved or unreserved, whether licensed or unlicensed, must take the same place eventually in Canada's economic development, and so federal stewardship entails management of all on the same basic principle of continuity. In the nature of things such a system of management depends to an unusual degree on the efficiency of the field force, as can be seen to-day in different timberland administrations in America. The whole success of such a policy is bound up in the calibre of the men in the field. They are the fingers of a business organization to see that the orders from higher up, as expressions of a certain policy, are carried out. Upon their capabilities and sincerity of purpose rests success or failure, and their inability to respond nullifies the wisest plans of the technical staff. On account of this relation, men for such work must be chosen solely on the basis of their qualifications for what they are paid to do. Political interference with a field force not only results in a weak organization, but has a more or less demoralizing effect on the superior staff. The system will not disappear in a day, but the United States timber administration service affords a stimulating example of what is possible.

With the adjustment of existing licenses the decks will be cleared for conservative management of Dominion forests. For all future sales the individual timber sale policy should be adopted (see p. 41). The amount of timber already under license, however, is far in excess of market requirements. It will be unnecessary for some years to dispose of timber other than on fire-killed areas, isolated blocks adjoining operations in progress, and stands on agricultural soil needed for settlement. It takes but a very simple calculation to see that stumpage values have only to rise in most cases a cent or two a year per thousand feet of lumber to meet the expense of holding by the Government—that is, to balance the loss of ground rent, fire tax and interest on bonus, compounded yearly.

This field of management of forests for continuity of crop passes under the name of forestry. Forestry is merely the business of handling timberlands in an improved way for perpetual revenue. It is often considered antagonistic to the lumbering business, but this is erroneous, because forestry is completely dependent on lumbering. Its intensity of practice is in direct co-ordination with the status of that industry. It is regulated lumbering, lumbering so regulated with the aid of technical knowledge that the forest may produce revenue forever.

In Canada this idea is but slowly making progress. Yet the fact that practically all the forest land, both federal and provincial, is vested in the Crown expresses one of the most important considerations, for forestry is a long-time public business, requiring stability of policy. In addition, it deals with matters affecting the prosperity of every Canadian—continued supply of forest products and conservation of water resources. Probably four-fifths of Canada is suited to tree growth only, and the Federal government has a national responsibility in taking the lead in utilization of forest soils.

APPENDIX

Regulations

Governing the Granting of Yearly Licenses and Permits to Cut Timber on Dominion Lands in Manitoba, Saskatchewan, Alberta, the Northwest Territories, within 20 miles on either side of the Canadian Pacific Railway in the Province of British Columbia, and the Tract of Three and One-half Million Acres to be located by the Government of the Dominion in the Peace River District in the Province of British Columbia. Approved by Order in Council of the 1st July, 1898, and subsequent Orders in Council.

EXTRACTS FROM FORM OF TIMBER LICENSE (REG. 17)

(a) That the licensee shall not have the right thereunder to cut timber of a less diameter than 10 inches at the stump except such as may be actually necessary for the construction of roads and other works to facilitate the taking out of merchantable timber, and shall not have the right to cut any trees that may be designated by the proper officer of the Department of the Interior as required to provide a supply of seed for the reproduction of the forest.

(b) The licensee shall be entitled to a renewal of his license from year to year while there is on the berth timber of the kind and dimensions described in the license in sufficient quantity to be commercially valuable if the terms and conditions of the license and the provisions of the Dominion Lands Act and of the regulations affecting the same have been fulfilled:

Provided that such renewal shall be subject to the payment of such rental and dues and to such terms and conditions as are fixed by the regulations in force at the time renewal is made.

(c) That the licensee shall take from every tree he cuts down all timber fit for use and manufacture the same into sawn lumber or some such saleable product, and shall dispose of the tops and branches and other débris of lumbering operations in such a way as to prevent as far as possible the danger of fire in accordance with the directions of the proper officers of the Department of the Interior.

(d) That the licensee shall prevent all unnecessary destruction of growing timber on the part of his men and exercise strict and constant supervision to prevent the origin or spread of fires.

(e) That the licensee shall pay, in addition to the said ground rent, dues in the manner prescribe, in section 20 of the Timber Regulations, and also one-half of the cost incurred by the Crown in guarding the timber from fire, the government paying the other half. A statement will be furnished the licensee showing his share of the cost incurred

APPENDIX

and payment thereof shall be made to the Crown within thirty days thereafter.

TIMBER PERMITS AND DUES

47. The permittee shall cut up the whole of the trees felled in such a way that there shall be no waste, and to prevent the spread of prairie or bush fires, the refuse (i.e., the tops and branches unfit either for rails or firewood), shall be piled together in a heap and not left scattered through the bush.

Permits issued to holders of berths shall contain a clause to the effect that one-half the cost of fire-guarding the timber shall be defrayed by the holders thereof, the Crown defraying the other half.

Regulations for Dominion Forest Reserves

Made under the Authority of Orders in Council of August 8, 1913, and September 24, 1913, in accordance with the Provisions of the Dominion Forest Reserves and Parks Act, 1-2 George V, Chap. 10, for the Maintenance, Protection, Care, Management and Utilization of all Forest Reserves Set Aside and Established as Dominion Forest Reserves by the said Act, of the Timber and Minerals in any of such Reserves, and for Prevention of Trespass thereon.

EXTRACTS FROM GENERAL CONDITIONS GOVERNING PERMITS

26. All timber cutting upon the reserves shall be done under the control of the forest ranger or other officer and subject to his instructions, and shall be subject to the following conditions:

- (a) Only such timber shall be cut as is designated by the forest officer.
- (b) No unnecessary damage shall be done to the young growth or to trees left standing.
- (c) All merchantable portions shall be taken from the trees cut and there shall be no unnecessary waste of timber.
- (d) Stumps shall not be cut higher than 18 inches without special permission from the forest officer.
- (e) All the débris of operations shall be piled for burning unless written permission to the contrary is given by the forest officer.